A REVIEW OF WORK
ON
INDIAN MEDICINAL PLANTS

Indian Council of Medical Research

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A REVIEW OF WORK ON INDIAN MEDICINAL PLANTS

(Including Indigenous Drugs & Poisonous Plants)

By

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FOREWORD

The use of indigenous drugs for the alleviation of human suffering is of considerable economic importance to our country. With this end in view the Indian Research Fund Association, now the Indian Council of Medical Research, has been sponsoring extensive researches in indigenous drugs for over two decades. The pioneering work in this field was done by Colonel Ram Nath Chopra at the School of Tropical Medicine, Calcutta and it may be said that we owe to him and to his students such knowledge as we today possess about the indigenous drugs of India. A review of the work done in this field was published by the Indian Research Fund Association in 1939. This review was greatly in demand. The Council therefore decided that it was essential to bring the subject up to date and requested Colonel Ram Nath Chopra to undertake the task. That he has done it very ably will be apparent from a perusal of the book. It gives in simple and non-technical language a brief account of the indigenous drugs so far investigated in India. The review should therefore be useful not only to practitioners of the indigenous systems of medicine in the country but also to scientists and to the lay public as well. It will indicate to the scientists which drugs require further investigation. The bibliography given at the end is a comprehensive one which, apart from its scientific value, will show the extent of interest which scientists both in India and abroad have taken in this subject.

Much yet remains to be done and many more drugs will have to be investigated scientifically by the application of modern methods of botanical, chemical, pharmacological and clinical research. I would, however, like to congratulate Colonel Ram Nath Chopra and his collaborators for their painstaking labour and for putting this material in such a concise and interesting form.

September 16, 1954.

AMRIT KAUR,
Minister for Health, India.

PREFACE

For many years past, the Indian Council of Medical Research, formerly Indian Research Fund Association, has given large grants to research workers all over India for the study of Indian Indigenous Drugs. In fact it was this body which was chiefly responsible for initiating work on this subject of great economic importance to India. The senior author was one of the first recipients of these grants when he was Professor of Pharmacology at the Calcutta School of Tropical Medicine and Medical College, Calcutta. As Professor at the former Institution, one of the duties laid down for him, was the study of Indian Indigenous Drugs. Financial resources from the School itself for this work were very limited then and it was the generous grants given by the Indian Council of Medical Research, extending over a period of more than three decades, both at the School and later at the Drugs Research Laboratory, Kashmir which enabled him and his co-workers to carry out screening studies of a large number of indigenous drugs. Considerable financial help was also received later from Indian Council of Agricultural Research and the Council of Scientific and Industrial Research.

In 1938 the senior author was asked to write a review of the work done on Indigenous Drugs under the Council upto that time, in simple non-technical language and a brochure was published in 1939. Large demand came from the public for this pamphlet and the edition was soon exhausted. In 1953 he was again requested to write a review of the work on Indian Indigenous Drugs, but this time it was not to be limited to work done under the Council but was also to include work done by other independent investigators. A thorough study of the whole literature on the subject was, therefore, undertaken by the present authors. It transpired that the work on Indigenous Drugs was being chiefly directed in the channel of investigation of Indian Medicinal Plants. Hence the change in the title of the present edition.

The general arrangement of the subject matter in the brochure of 1939 has been again adopted. Brief summaries of the work done on various drugs have been given in "telegraphic language". A comprehensive bibliography has been given, arranged subject wise and with full titles of papers. Lists of plants used in the treatment of various diseases in the indigenous systems of medicines have also been given after a careful analysis of the literature.

It is hoped that this review will be read by those interested in indigenous drugs and their practical use for alleviation of human ailments. As the descriptions are given in simple non-technical language and common vernacular names have been included, the present volume will be of interest not only to research workers but also to the public in general. The bibliography of nearly two thousand publications on the subject, collection of which has involved immense labour, will we trust, be useful to research workers and others.

In writing the present volume we wish to gratefully acknowledge the assistance we have received at every stage from Mr. K. L. Handa who has helped in collecting references from literature and has checked up the chemical data. Messrs. L. D. Kapoor and B. K. Abrol have checked up botanical terms and synonomy and Dr. Kartar Singh Pharmacological Assistant in Indigenous Drugs Enquiry has rendered valuable assistance.

To the Governing Body of the Indian Council of Medical Research, its worthy President Rajkumari Amrit Kaur and its able Secretary Dr. C. G. Pandit, the authors are grateful for the generous grants for work on Indigenous Drugs. These grants are being continued even now and are enabling the authors to carry on the work at the Drug Research Laboratory.

Finances were also kindly provided by the Council for the preparation of the manuscript and the printing of this volume.

Drug Research Laboratory,
Jammu. April, 1954.

R. N. CHOPRA.
I. C. CHOPRA.

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CHAPTER I

A REVIEW OF WORK ON INDIAN MEDICINAL PLANTS

(including Indigenous Drugs and Poisonous Plants)

INTRODUCTION

The Indian Materia Medica, including the common household remedies, at present includes about 2,000 different drugs. Many of these are in actual use in different parts of India. Of this number approximately two hundred are of mineral origin, about two hundred are of animal origin and the remainder are of vegetable origin. The mineral drugs are mostly compounds whose chemical composition is generally known and whose actions are in most cases not difficult to understand. The drugs of animal origin are a very varied assortment, few of which have been shown to have any rational usage. The study of indigenous drugs, therefore, chiefly means a study of Indian medicinal and allied plants in which there is a vast and very rich field for investigation.

Climate and topography. The extreme variability that India presents in its meteorological and climatic conditions as also in its topographical features is perhaps unrivalled in the world. The tremendous range of variation of temperature from 126°F in summer in desert areas to minus 46°F in winter in Dras in Kashmir, and the prevalence of arctic conditions throughout the year in some of the Himalayan ranges are well known. The annual rainfall varies from 430 inches at Cherrapunji in the hills of Assam to less than 5 inches per annum in the desert areas of Rajputana. The air is saturated with moisture in the coastal districts and in the hills during the south-west monsoon and there are periods of practically zero relative humidity in the dry weather. These are some of the interesting contrasts presented by this vast country in which we live.

No less striking are its physical features. It has the most massive and the loftiest range of mountains in the world, the Himalayas. There are also lower hills and plateaus, extensive rich alluvial plains, sandy wastes and deserts, hills, streams, mighty rivers with their extensive deltaic and estuarine systems, numerous lakes, canals, ponds, tanks and extensive marshy tracts, sandy or rocky coasts spread over an area of more than a million and half square miles. The country is in fact an epitome of almost all climates, seasons, and soils of the world. Under these conditions it is not surprising that India possesses one of the richest and certainly the most varied flora of any area of similar size on the surface of the globe.

Features of Indian Vegetation. Roughly speaking, one-fifth of the Indian sub-continent is occupied by forests of different kinds. There are ever-green forests occupying the west coast of the peninsula up to the ridges of the Western mountain chain, and the lower slopes of the

Note .— This work was initiated by the Indian Council of Medical Research formerly Indian Research Fund Association.

Eastern Himalayas, with their magnificent and majestic trees, the 'sky scrapers' many centuries old. A large part of the peninsula is covered by the deciduous type of the forests which are very valuable to the country. There are the dry forests of Rajputana and the Punjab which are also spread over a large area of Indian States. There is very little vegetation of any kind in the Great Indian Desert itself.

Many tidal creeks and backwaters along the coasts of India, chiefly the deltas of rivers, such as the Sunderbans are covered with another type of evergreen forest, the tidal or littoral, where many plants send up from their underground roots a number of aerial roots for respiration. The massive chain of the Himalayas with its tropical, temperate and alpine flora presents unique features. The eastern Himalayan flora differs remarkably from the western in several respects in addition to the disappearance of the tropical type as the extreme north-west is reached. It is in this chain that the highest limit of vegetable life on earth has been recorded. The tree limit in the Western Himalayas corresponds roughly with the snow-line, i.e. 12,000 ft. above sea level, above which a variety of beautifully coloured flowers flourish. Aquatic or semi-aquatic types of vegetation are found in the tanks, jhils, ponds, water-courses and swamps all over India, particularly in Bengal. Lastly, there are areas in the plains, as well as in the hills, especially in the former, which have, through the influence of man in search of more and more agriculturally exploitable land, lost much of their original characters. Another feature of the Indian vegetation is that whereas in one season of the year, vast areas in the plains of India are the scene of plenty for man and animals, in another they become a dreary brown sunburnt waste where herbivores starve by the thousands and where it passes human understanding how any creature dependent on plant life can survive the dry season.

Relationship to other floras. The Indian flora is closely related to that of some other countries, and it is interesting to remark that none of families of flowering plants is peculiar to this country. There is a very great preponderance of those genera and species which are also found in the adjacent countries. Malayan, Burmese and Chinese genera are specially well represented in Eastern India. Next in order come the European and Middle East flora which are particularly strongly represented in Western India. Of the typically European elements there are twice as many in the Western as in the Eastern Himalayas. Nearly 600 European genera are represented in India, many of them by a single species, and the Middle Eastern element is certainly, as is only to be expected, no less prominent. African, Australian and American elements follow these in decreasing proportions, the African flora being more noticeable in Western India. Recently there has been an influx of American species with their remarkable tendency to spread. Tibetan and Siberian floras only reach India in the alpine regions of the Himalayas, while Chinese and Japanese elements are strongly represented in its temperate belts. All these factors tend to make the Indian flora very rich and cosmopolitan and full of possibilities of economic importance.

CHAPTER II.

MEDICINAL PLANTS OF INDIA

India abounds in all kinds of food plants, spices, perfumes, timber, fibres, gums, etc. which have been known all over the world from ancient times. There are more than about 700 important fodder plants including about 260 species of valuable fodder grasses. It is not surprising, therefore, that plants containing active and medicinal principles also grow abundantly within its bounds. More than 2,000 plants, out of a total of about 11,000 species found in India, are alleged to have medicinal properties of some description or other and have been enumerated in the literature of indigenous medicine. Nearly three-fourths of the drugs mentioned in the British and other Pharmacopoeias grow here in a state of nature and others can be easily grown. Indeed, this country is a veritable emporium of drugs. The families to which the larger numbers of medicinal plants belong are Leguminosæ, Compositæ Labiatæ, Euphorbiaceæ, Rubiaceæ, Rosaceæ, Gramineæ, Liliaceæ, Rutaceæ, Ranunculacæ, Umbelliferæ, Cucurbitaceæ, Solanaceæ, Apocynaceæ and Malvaceæ.

It stands to reason that all these 2,000 odd plants cannot possess the wonderful virtues attributed to them, but it is believed that there are some of these which might rightly deserve the reputation they have earned as cures. In order to determine what these were and what medicinal properties they possessed the study of these plants was begun in the early part of the last century.

The early studies were mainly confined to collection of available data from the literature of indigenous medicine as well as getting information about their popular use as household remedies by the people. A rough survey with regard to the occurrence of these plants in different parts of the country was undertaken by various workers and in some cases chemical analysis of a preliminary nature was also carried out. Modern medicine however, is intimately related to chemistry and detailed examinations of active principles of plants and other products form an essential part of it. Experimental work on the pharmacological side to determine the action of these active principles needs laboratories well equipped with modern apparatus and appliances which were not available in those days. Work on medicinal plants on modern scientific lines was thus started in the early part of this century with the main objective of making India self-sufficient and self-supporting by enabling her to utilize drugs produced in the country and by manufacturing them in a form suitable for administration. There are a number of drugs of established therapeutic value which are in use in the pharmacopoeias of different countries. Many of these grow wild and some in great profusion in different parts of India and a certain number are even cultivated. If these resources could be developed and utilized and the finished products manufactured, treatment of many diseases could be brought within the means of the Indian masses whose economic condition is unfortunately of a very low order.

A number of important drug plants extensively used by the medical profession, however, are neither found growing in a state of

nature nor have so far been cultivated in India. Cultivation of such plants is very important from an economic point of view, and scientific research in this direction, as is being carried out in other countries, would be very fruitful. It is a matter of regret that India is still importing quantities of crude drugs in spite of the fact that practically every conceivable pharmacopoeial drug can be grown within her bounds. The history of the cultivation of cinchona, eucalyptus, digitalis, etc. in India clearly shows that the cultivation of medicinal plants is pregnant with rich possibilities if taken up on proper lines. It is gratifying to note that in recent years a growing and increasing interest is now being taken in this direction.

Remedies used in Indigenous Medicine. The second objective has been to discover remedies from the claims of Ayurvedic, Tibbi and other indigenous resources suitable for employment by exponents of Wetsern medicine. This is only possible if these are shown to have effective active principles in them. Since the period of decay and resuscitation of old systems of Indian medicine, knowledge of many of the effective remedies was lost while a number of uncertain ones crept in. Belief in their efficacy originates in some cases from the teachings of the ancient commentators and is based on clinical data. In others, however, there is no basis whatever. The object of research initiated by the Indian Council of Medical Research (formerly Indian Research Fund Association) was to determine which of these plants had the therapeutic efficacy claimed and which had not. Since this work was started about thirty years ago, several hundred medicinal plants have been partially screened and investigated by workers in this country. Some of these have been shown to be of great practical utility and have been actually brought into use. Many of the others were found to have effective medicinal properties and could be brought as cheaper substitutes for pharmacopoeial and Extra-pharmacopoeial drugs. A large number of others were found to be entirely useless. Much, however, remains to be done and hundreds of plants with alleged medicinal properties, remain to be investigated.

Collection of drugs. A few words may be said here with regard to the time of collection of drugs, for purposes of examination. This should be done at the proper time when the plant matures and the active principles are at their maximum. If this is not done even effective drugs may be found to have no activity. During the last twenty five years several drugs of Indian origin have assumed considerable importance from the point of view of foreign trade. Many firms of drug manufacturers in this country also use the locally produced raw materials for the manufacture of the finished products. It is a matter of very great concern, therefore, that the crude drugs collected locally are often not up to the required standard and this has resulted in considerable economic loss. Fortunately, this state of aflairs is being gradually rectified. It must be stated however, that collection of drugs is not so simple a matter as most people seem to imagine. Collectors of medicinal drugs growing in a state of nature, and the present and prospective cultivators should bear in mind that there are certain factors which have to be considered in order to obtain standard medicinal products. There is a good deal of variation in the active principles in the different parts of a plant and in different seasons in the same part of the plant. Even the same part and at the same time of the year shows remarkable variations

in the contents of its active principles. For example, the young and the old leaves of a plant and unopened and opened flowers differ materially despite the fact that they are collected from the same plant and during the same season.

The soil also has an important influence on the active principles of plants. It has often been observed that plants collected at the proper time, when the active principles have reached maturity and are at their maximum, give very effective results while the same plants when collected under other conditions are utterly useless. Conditions for the collection of drugs in the case of plants under cultivation are more favourable and strict control over various factors can be exercised with greater ease than is the case with plants growing in a state of nature. It has, however, to be admitted that ideal conditions for the collection of even many of the common and important medicinal plants are not known with precision and research is urgently needed to determine the time when the active principles are at their maximum under the environments existing in this country, as was done by the Dutch in Java in the case of cinchona. If this could be systematically carried out, India could supply itself and other countries with medicinal 'herbs'.

CHAPTER III

INDIAN INDIGENOUS DRUGS

Main lines of basic research. Having given a general account of the potentialities of this country with regard to medicinal plants, we will now briefly describe some of the important lines of basic research taken up by workers in this connection. The first of these is study of Indigenous Drugs of India.

Indigenous Drugs of India. It is desirable to point out at the outset that the term 'Indigenous Drugs' has been used, for the purposes of research in its widest sense so as to include within its scope not merely those drugs which were originally the natives of India, but also those which have been introduced from outside and have become completely naturalised. Drugs which are cultivated in India, whether used in the indigenous system of medicine or in the pharmacopoeias of various western countries, have also been brought within the purview of this investigation. The term also includes locally manufactured preparations of mineral and animal origin which are used in medicine as practised in India.

Historical. The study of Indian indigenous drugs was first begun in the early part of the last century and it was then confined chiefly to the collection of available information with regard to various medicinal plants growing in different parts of the country. The earliest contributions were from the writings of Sir William Jones whose memoir entitled "*Botanical Observations on Select Plants*", is well known. This was followed in 1810 by John Fleming's "*Catalogue of Medicinal Plants*", Ainslie's "*Materia Medica of Hindustan*" in 1813, and Roxburgh's "*Flora Indica*" in 1820. In 1844 O. Shaughnessys published his "*Bengal Pharmacopoeia*" which was the first book of its kind which dealt exclusively with the properties and uses of the medicinal plants used in Bengal. In 1868 a "*Pharmacopoeia of India*" was published under the able editorship of Waring. It signalized a new epoch in establishing and recording the value of indigenous medicinal products on modern lines. The more important drugs were officially recognised with a view to their eventual adoption in the British Pharmacopoeia. As a large number of the drugs, especially those in local use by practitioners and as household remedies, were not included in this work, Mohideen Sheriff published his "*Supplement to the Pharmacopoeia*" in the year 1869. He is also the author of "Materia Medica of Madras" which was edited and published after his death by Hooper. U. C. Dutt's translation of Sanskrit Materia Medica brought into prominence the drugs used in the old Hindu Medicine even now largely practised in India. Then Fluckiger's and Hanbury's "*Pharmacographia and Materia Medica of Western India*" 1883 was published. These were followed by the publication of that very comprehensive book on the Indian Medicinal plants the "*Pharmacographia Indica*" in 1885 under the joint editorship of Warden and Hooper. This treatise contains a mass of information regarding the uses of the indigenous materia medica in the Eastern and Western medicine. The most elaborate work of all is "*A Dictionary of the Economic Products of India*" published in 1895 by Sir George Watt; the Reporter on the Economic Products to the Government of India. This monumental work, compiled with the help of a large team of workers; refers

to all the previous work on medicinal plants and other plants of economic importance. Its pages are full of information of every description regarding the use of different barks, roots, flowers, leaves and woods for different medicinal and other purposes. Works published still later such as Kanai Lal Dey's "*Indigenous Drugs of India*" and Kirtikar and Basu's "*Indian Medicinal Plants*" are largely summaries and compilations from the above mentioned literature in a more systematised and elaborated form. In the last named book, plates illustrating various important medicinal herbs are given which greatly help the reader in differentiating them from plants with which they are apt to be confused.

The literature mentioned above is very valuable, as it contains not only information from Ayurvedic and Tibbi sources, but also gives the results of personal observations and experiences of some of the writers. There is no doubt that a considerable amount of botanical investigation into the scientific names of many medicinal plants was accomplished. More, however, remained to be done in the case of a large number of plants to clear up many points with respect to their exact botanical sources. Many drugs that had escaped the previous investigators require to be explored in all their details.

Admirable as all these attempts were, the pharmacology of most of the indigenous remedies remained an unexplored field till recent years. The reason for this is not far to seek. Investigations of this nature require a considerable outlay of money in the form of well-equipped chemical and pharmacological laboratories, while a liberal staff of competent chemists and pharmacologists is another essential prerequisite. Medicine we have observed is now intimately related to chemistry, and the ultimate solution of most problems, whether physiological or biological, rests on some physical or chemical basis. This is forcibly presented to us in the study of the action of drugs. The importance of the cooperation of chemists at every stage of research work can only be realised by the workers themselves. If satisfactory results have to be achieved and if the work is to be carried out on the same standard as in other civilised countries, the cooperation of competent chemists with experience is the first essential.

It must be pointed out that the time and labour required to work out the chemical composition of a single drug are enormous. This may be judged from the fact that it would take an experienced chemists several months, perhaps a year or more, to isolate in a pure state and roughly describe the nature of the different chemical constituents of a single crude drug. The determination of the chemical constitution of the active principles concerned would take a considerably longer time. The isolation of a sufficient quantity of the active principles and the testing of them pharmacologically would occupy many months. The magnitude of the task of working out all the drugs used in the indigenous systems of medicine in detail transcends all imagination. There is such an enormous scope for research in this field, and so little has been done, that it is impossible for any one individual or any one institution to cope with it adequately. The cooperation and intimate association of a large number of sincere and devoted workers of ability is needed to find the truth. This is now being gradually done. Chairs in Pharmacology have been founded by the various Universities and Medical Colleges and facilities for research work on modern scientific lines are now being made increasingly more available.

As the action of these drugs or their active principles can only be established by a careful chemical, pharmacological and clinical study, the investigation in all the three aspects should be carried on side by side. The experimental work on the pharmacological side can be done only in laboratories well equipped with all modern appliances. The first laboratory of its kind established in this country was at the School of Tropical Medicine, Calcutta in 1921. One of the main duties of the Professor of Pharmacology laid down was investigation of the indigenous drugs on scientific lines. The chemical department of this institution had a small team of chemists who worked out the chemical composition of drugs, isolated the active principles and handed them to the pharmacologist for determination of their action on the animal organism. The clinical testing of the drug was made possible by the Carmichael Hospital for Tropical Diseases a research hospital attached to this institution. In this way it was found possible to go through a number of drugs in all the varied phases of their investigation, i.e. from the isolation of their active principles to the testing of their action on animals and finally to the making of suitable preparations for trial on patients, and for recording the results of therapeutic trials.

The staff of the Departments of Pharmacology and Chemistry of this institution was only a nucleus to start this work. It was wholly inadequate to deal with such an immense task in addition to its ordinary duties of post-graduate teaching. Although a modest beginning was made in 1921 when the School started functioning, it was not really till 1926, when the Indian Research Fund Association, now known as the Indian Council of Medical Research, gave a grant to develop this work. Investigations were then taken up in right earnest and on proper systematic lines. During the years that followed, the importance of this work was appreciated with greater emphasis and the grants were considerably increased. It was realised by this body that this was the only effective reply to attempts at the wholesale revival of the indigenous system of medicine which were then in evidence. In 1935 the Imperial Council of Agricultural Research (now Indian Council of Agricultural Research), appreciating the importance of basic research of this type which was being done gave a grant for the investigation of the closely allied group of Poisonous Plants and Food Poisons of India which are such a menace to man and live-stock in this country. By this grant the research facilities for work on indigenous drugs were also further augmented and certain deficiencies which existed in the technical staff were made good. An efficient Botanical Unit was thus provided, the want of which had been very keenly felt in connection with the research work on medicinal plants.

With all these facilities made available it was possible to undertake the study of a large number of drugs in all the varied phases of their investigation i.e., from the isolation of their active principles to the testing of their action on animals and finally making suitable preparations for trials on patients and for recording results of therapeutic trials.

During the three decades that have followed, the research work on indigenous drugs has received considerable encouragement and has made satisfactory progress. The example of the Indian Council of Medical Research and Indian Council of Agricultural Research was followed by the Council of Scientific & Industrial Research. This Council

gave very generous grants to various Medical Institutions and other research bodies for this work. It also established in 1950, the Central Drug Research Institute at Lucknow as one of the eleven major National Laboratories of India. One whole division of this great Institution is devoted entirely to the study of Indian Indigenous Drugs. With the dawn of Independence, therefore, this research has been put on a sound and firm basis. Much has been accomplished, in the study of Indian Medicinal Plants on systematic and scientific lines, though much more remains to be done. A brief review of this work will be found in the following pages.

It is obvious from what has been stated above that the Indian Council of Medical Research with its predecessor the Indian Research Fund Association were the pioneers in encouraging the study of Indian Indigenous Drugs on scientific lines. It was the example of this body which stimulated interest on this important subject of vital importance to the country.

CHAPTER IV

BASIC REQUIREMENTS FOR STUDY OF INDIGENOUS DRUGS

We have said above that detailed study of Indigenous Drugs is not a one man job. It needs close collaboration and association of scientific workers in different allied subjects. The prerequisites for the work to be done properly on scientific lines are:—

1. **A Botanical Unit**. This Unit should consist of experienced botanists and technicians. They help not only in the collection and identification of genuine drugs, but also in carrying out a survey of the medicinal and poisonous plants growing in different parts of the country. The importance of this section must not be under-rated, as on the correct identification of the drugs depends the utility and authenticity of the whole work. In the early stages, when expert botanical help was not available, many mistakes were made in connection with the identity of medicinal plants, thereby causing much confusion and waste of effort. An extensive herbarium of these plants is being gradually built up by our botanists. This is a unique collection of its kind in India, and is rendering the correct identification of medicinal plants for any trained worker an easy matter.

2. **A Chemical Unit**. This should consist of a band of expert research chemists with special experience in plant chemistry. They should be trained for work in different aspects of plant chemistry involving extraction and identification of active principles, such as alkaloids, glucosides, essential oils, neutral principles, antibiotics etc. The medicinal or poisonous plants sent by different forest officers or collected by the botanists, are first dealt with in this department and an attempt is made to determine the active constituents that may be contained in them. The preliminary chemical examination, the isolation of the different constituents which may have pharmacological action, their purification and elementary analysis all require considerable time, patience and skill. It may be stated here, that the isolation of the active principles of plant constituents is not an easy task of a routine nature, as may perhaps be imagined. Each plant has its own peculiar problems and difficulties which have to be solved. This can only be done by chemists with considerable practical experience and technical skill. Besides being engaged in the isolation and identification of active principles of plants, the chemical section is also required to assist in chemical and biochemical assays of different drugs, in the preparation of galenicals, extracts, etc. for purposes of clinical trial in the hospitals. The work involved, therefore, is of a varied and comprehensive character. Efficient teams of workers, have now been brought into existence after many years of training, and the analytical work is being considerably facilitated as more experience is being gained.

3. **A Pharmacological Unit.** This is composed, preferably of medical men especially trained in the technique of experimental pharmacology, who work under the guidance of a pharmacologist with large practical experience of this type of work. They test the different preparations or the purified active constituents isolated by the chemists by properly planned animal experimentation. They also carry out biological assays, test the toxicity of drugs and suggest suitable doses for therapeutic trials. Here also experience assists a great deal in assessing the

value of the reactions produced in animal tissues by drugs under investigation and their practical application to therapeutics in man.

4. **A Clinical Unit**. This section carries out testing of drugs on patients in the out-patients department and in the hospital. This work is carried out under the direct guidance of experienced pharmacologists and clinicians. It has often happened that drugs have been tried in a haphazard fashion by medical practitioners and wrong conclusions have been drawn. The proper clinical evaluation of these drugs needs a well equipped hospital with a specially trained house staff of medical men and nurses, in which patients can be kept and watched for weeks and months if necessary. The clinician in charge of such investigation should also have experience of this type of work which needs considerable patience and sound judgment.

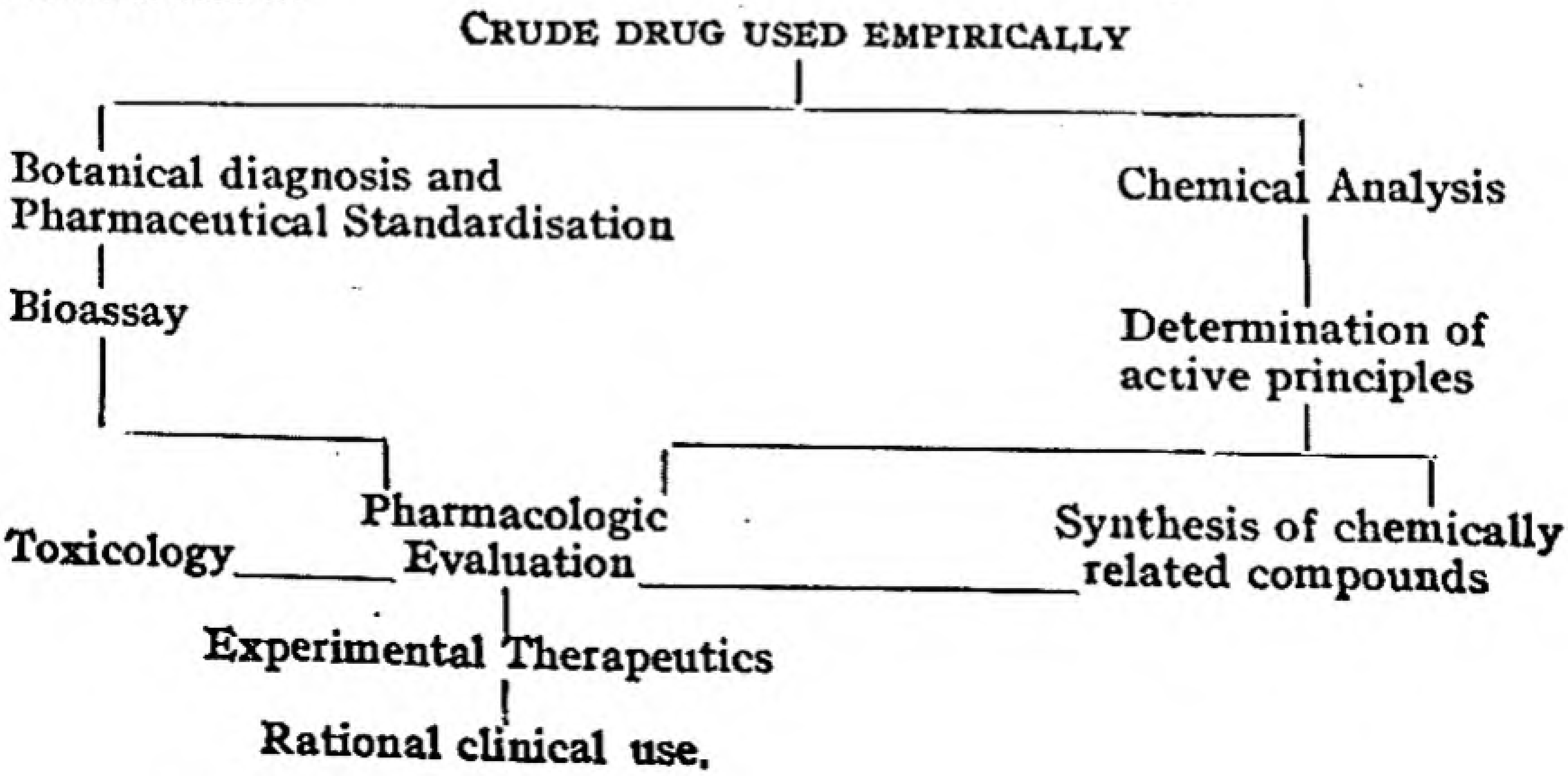
The existence of such teams all working in close cooperation, makes it possible to carry out this type of work on proper systematic lines. Research work of this nature started in institutions or university laboratories is often cut short at an early stage as the workers have to depend on institutions such as Hospitals for trials. Again some of the universities and colleges do not possess properly equipped laboratories for pharmacological studies. The procurement of all these facilities is expensive and make this work difficult. If such organisations as Indian Council of Medical Research, Indian Council of Agricultural Research and Council of Scientific & Industrial Research had not come forward with generous grants, it would not have been possible to make any headway.

It will thus be seen that from the stage of empirical knowledge available of a crude drug to bring it to its rational usage in modern medicine, it must pass through the following stages :—

(1) Botanical identification. (2) Chemical examination and isolation of active principles. (3) Determination of their pharmacological action and toxic effects. (4) Chemotherapeutic studies in animals. (5) Clinical trials in man.

In case of well-known drugs of established value in indigenous medicine, it may some time be convenient to start with clinical trials first and proceed to analysis and laboratory tests afterwards. A schematic idea of the work is given below :—

PROCEDURE I.



PROCEDURE 2

CRUDE DRUG USED EMPIRICALLY

Prep. of powders, infusions, Extracts, Tinctures, etc.

Preliminary trial in small doses in humans to determine undesirable effects, if any.

Choice of a promising drug

Rational clinical use

Synthesis of similar compounds — Chemical Analysis

Determination of active principles

Pharmacology

Standardization

Extended clinical use — suitable Pharmaceutical Prep.

In whatever way the investigation is carried out on an indigenous drug, the work is time-consuming and can only be done by team-work of several groups of scientists each expert in his own field. The work should be co-ordinated by a medical scientist of experience who can draw logical conclusions from the data obtained. Haphazard approaches to this work have led to wrong conclusions and much confusion.

CHAPTER V

SCOPE OF WORK ON INDIGENOUS DRUGS

Work on indigenous drugs on modern scientific lines was initiated by the senior author when he was appointed Professor of Pharmacology at the School of Tropical Medicine, Calcutta with the following main objects in view :

1. To make India self-supporting by enabling her to utilise the drugs produced in the country, by manufacturing them in a form suitable for administration.
2. To discover remedies from the claims of Ayurvedic, Tibbi and other indigenous sources suitable to be employed by the exponents of Western medicine.
3. To discover the means of effecting economy, so that these remedies might fall within the means of the great masses in India whose economic condition is very low.
4. To prepare an Indian Pharmacopoeia including indigenous remedies of value.

(1) To make India self-supporting so far as drugs and their preparations are concerned.

Pharmacopoeial and Allied Drugs. The first proposition is likely to lead to great results, because a large number of drugs which grow in this country are known both to Eastern and Western medicine and the properties and actions in many cases are also known. The research here has been diverted into two main channels. Firstly, there are many drugs of established therapeutic value which are in use in the pharmacopoeias of different countries. The majority of these grow wild and in abundance in many parts of India and a certain number are even cultivated. Some of these are collected and exported, though only a small fraction of the quantity produced, to foreign countries and come back to us in the form of standardised pharmaceutical preparations and active principles in pure condition, probably at a price many times that of the original crude product. A host of others grow, mature and eventually die without being put to any practical use whatsoever. There are numerous examples which have been dealt with in detail elsewhere. A brief description of those investigated is given hereafter in this review with short notes with regard to the work done.

Besides these, there are a number of pharmacopoeial drugs which are widely used by the medical profession, but which do not naturally grow in this country. They thrive, however, when they are cultivated under proper conditions in suitable parts of the country. Examples of such drugs are numerous but a few of the important ones such as digitalis, ipecacuanha, eucalyptus, cinchona, jalap, etc., may be cited. They were introduced into India many years ago and are doing well. On account of the great demand for these drugs in medical practice, their production

in this country is of great economic importance. India, we have stated, possesses most wonderful variability so far as the temperature and general climatic conditions are concerned, and every conceivable drug ranging from those growing in the hotest tropical and damp climates to those growing in dry, temperate and very cold climates can be grown and acclimatised in some part or other. From the geological point of view also every grade of soil from alluvial deposits to hard rocky formation and sandy deserts are met with. Professor Greenish of the London School of Pharmacy rightly said, "India owing to the remarkable variations she possesses of climate, altitude and soil, is in a position to produce successfully every variety of medicinal herb required by Europe".

It should be remembered, however, that the soil, the season and the gathering time are some of the important variable factors with plants, and it can hardly be expected that the amount of active constituents would be constant under all conditions. In some cases the quality is good and constant, but in the majority of instances the percentage composition of active principles has to be determined by careful methods of chemical and biological assay, to show that these remedies, growing in a state of nature, are as good in quality as those required by the standards laid down in the Pharmacopoeias. If they do not come up to the required standard, the best method of bringing them into general use by improving the quality of the active principles by suitable cultivation, in parts of the country where this can be done economically, has to be determined.

The work done so far in connection with these two groups of plants, has been responsible for bringing into use a large number of crude drugs, which were formerly imported from foreign countries by the drug manufacturing industry, by showing that the active principles of many of the indigenous plants came up to the standards laid down by the pharmacopœia.

Secondly, a large number of plants grow in India which, though not exactly the same, have properties and actions similar to the imported and often expensive remedies and would form excellent substitutes. Not infrequently there are some closely allied species which are pharmacologically just as active. The properties of these plants are being worked out on scientific lines and they are being brought into use. Some examples may be cited here. *Colchicum luteum* growing on the slopes of the western temperate Himalayas has been shown to be an excellent substitute for the official *C. autumnale*. *Scilla indica* grows extensively on the sea-coast and on the drier hills of the lower Himalayas and the Salt Range and is being used as a substitute for *S. maritima*. *Ferula narthex*, growing in Kashmir, yields a gum resin resembling asafœtida. The properties of *Picrasma quassioides* and *Gentiana kurroo* resemble those of *Picrasma excelsa* and *Gentiana lutea* which are official in the British Pharmacopoeia. Many other examples could be cited.

In both these groups there is a large field for research and development and considerable work has been done in connection with recognition of their active ingredients, determination of their percentage composition and establishing their pharmacological action. Pharmaceutical preparations are now manufactured from these indigenous products to the immense advantage of the country.

(2) To discover remedies from the claims of Ayurvedic, Tibbi, adn other indigenous sources.

The Drugs used in the Indigenous Medicine. The second proposition of popularising and introducing new drugs to Western medicine is a more difficult one. It is believed that out of the very large number of drugs used in the indigenous systems of medicine for centuries past, and still in use, there must be some at least which might deserve the reputation they have earned as cures. Since the period of decay and recompilation of old Indian systems of medicine, many of the effective remedies have been lost and a number of uncertain ones have come in. The result is that in the indigenous systems, at the present time, almost every plant and shrub growing in the country has ascribed to it some medicinal virtue. These beliefs in some cases originate from the teachings of the ancient commentators and are based on clinical data, but in others have no foundation whatever. Their introduction was empirical and often a drug was used simply because a single case appeared to have derived some benefit from it. In this way remedies have multiplied without proof but by belief and as they hail from all parts of India, no one seems to have a correct notion about their uses and properties. The employment of a large number of them would thus appear to have been based on empirical evidence handed down from generation to generation. A thorough and complete research into all these drugs would constitute the life long work of innumerable chemists, pharmacologists and physicians. For practical purposes the method adopted by workers has been to make use of the experience of Vaids, Hakims and others, and to take up for investigation those drugs which have a great local reputation before touching the less known remedies. Besides, many of these drugs have been clinically tried by medical men practising Western medicine, who have expressed their opinion regarding their efficacy; this has also been helpful in the selection of drugs to be investigated. In this way a large number of commonly used drugs have been scrutinised.

(3). How to effect economy and bring the treatment within the means of the masses.

The third proposition relates to the devising of expedients for effecting economy, so that these remedies may reach the masses. This is only possible if the price of the drugs can be considerably reduced; for in a poor country like India, there are millions of people who cannot afford any kind of treatment, whether cheap or expensive, and have consequently to depend upon charitable medical relief institutions. The cost of drugs is so heavy that most of these institutions, which have only a limited annual budget for drugs, are not able to cope with the demand for such common and essential drugs as quinine, castor oil, magnesia, etc., to say nothing of the expensive medicines which are sometimes necessary and even indispensable.

The only way in which drugs can be cheapened and brought within the means of the masses is to utilise the local resources and substitute the indigenous products for the more expensive imported preparations of Western medicine. This can be done by encouraging the production, collection and manufacture of the local materia medica by preparing pharmaceutical preparations in a systematic manner. By local production and substitution of equally potent drugs of Indian origin for the imported drugs, the cost of treatment can be considerably reduced.

We have already made a reference to some of these remedies and the possibilities of their development. Their active principles are now being isolated, and standardised preparations such as tinctures, extracts, powders, etc., are being prepared by a number of reliable manufacturers. If this aspect is further developed it will be possible to affect large scale economy.

It is a matter of satisfaction to note that a great deal has been done towards the development of a drug manufacturing industry in India, and towards encouraging the use of raw material produced in the country for the preparation of galenical and other preparations. The price of preparations has already come down considerably during recent years and by further development of this industry it is hoped that there will be further reduction in prices. The factors which were militating against the bringing down of the prices of medicinal preparations to the level of the low economic conditions of the masses were fully investigated by the Drugs Enquiry Committee (1930-31). These were firstly, the excise duty on alcohol used for bonafide medicinal purposes by the manufacturers, and secondly the high railway freight for purposes of transportation of drugs from one part of the country to another. Attention is being given to all these and drug industry in India is being put on a sound basis.

(4). Indian Pharmacopoeia.

The fourth proposition of preparing a Pharmacopoeia is by no means an easy one. A national Pharmacopoeia is primarily meant to meet the claims and satisfy the needs of a particular group of physicians at a particular time. There must exist, and there does exist, a great difference not only between the Pharmacopoeias of various countries, but also between various editions of the same Pharmacopoeia.

The object of a Pharmacopoeia is, in the words of the founders of the United States Pharmocopoeia, 1820, "to select from among substances which have medicinal power those the utility of which is most fully established and best understood, and to form from them preparations and compositions in which their powers may be exerted to the greatest advantage."

The modern Pharmacopoeia is above all a book of standards. Its fundamental object and scope is, "to provide standards for the drugs and medicines of therapeutic usefulness or pharmaceutic necessity sufficiently used in medical practice; to lay down tests for the identity quality, and purity, to insure, as far as possible, uniformity in physical properties and active constituents." In other words, usage, rational usage and scientific usage are the basis of judgement.

The evidence placed before the Drug Enquiry Committee 1930-31 showed that India should have an official publication which would record what she recognizes as a trustworthy and approved materia medica upon which can be established modern food and drug acts, poison laws, systems of taxation, and the modernization of legal medicine. Her best scientific men should be enlisted to shoulder the responsibility of working out India's own standards and to develop the necessary analytical laboratories, biological institutes and pharmaceutical schools. It involves not only the development of machinery for the administration of laws based upon official standards, it means also finding an authoritative standard

which every doctor and pharmacist in India will hail as a real guide in every-day work.

A consideration of what is said above will show that although the preparation of an Indian Pharmacopoeia is very desireable, a very large amount of work must necessarily be done before such a work can be prepared. The Drug Enquiry Committee 1930-31 carefully considered the question of the compilation of an Indian Pharmacopoeia and thought that the utility of such a work for the country cannot be overrated.

The pharmacopoeia which is in view ought to include the therapeutically active substances and, to find admission to it, a drug must be of known composition, of definite pharmacological action, and of well-established therapeutic use, and fully investigated for its toxicity and necessary standard for determining a safe maximum dose, with a chemical or biological standard. The large mass which do not satisfy this condition should be left out. Necessary tests have to be developed for the protection of doctor, pharmacist, and patient. India ought to set a standard of strength and purity for the material which is to appear on her markets.

This work should be on the lines of the British and the United States Pharmacopoeias including only drugs of known composition, of definite pharmacological action, of well-established therapeutic properties, with known toxicity and the necessary standards of chemical and biological assay for determining the safe maximum doses.

The work which is being done on the Indian Indigenous Drugs is exactly the type of work which will eventually lead to the preparation of an Indian Pharmacopoeia. But it is obvious that much more will have to be done before such an authoritative publication can be prepared. The Drug Control Laboratory at Calcutta and later the Central Drug Research Institute, Lucknow have helped greatly towards evolving standards suitable for this country. A large number of drugs commonly used have been fully worked out, and the conditions above stated are being satisfied with regard to them.

It is a matter of great satisfaction to note that work on these drugs has sufficiently advanced to lay the foundation of an *Indian Pharmacopoeia*. As a first step towards it an *Indian Pharmacopoeia List* was prepared by the Committee set up by the Government of India under the auspices of Drugs Technical Advisory Board in 1947. This was published in 1949 and is an authoritative document laying down standards for Indian climatic and other conditions for drugs sufficiently worked up to be included in the List. The Health Ministry then set up a Permanent Pharmacopoeia Committee. This Committee has been at work since and with the help of number of sub-committees composed of experts from all parts of India has now practically completed the labour of compiling the first edition of Indian Pharmacopoeia which will be published in the near future. The pioneering work done in connection with the preparation of Indian Pharmacopoeia by the Indian Council of Medical Research (formerly Indian Research Fund Association) cannot be overrated. As early as 1926 this body appreciated the importance of the study of Indigenous Drugs on scientific lines as a preliminary to compilation of an Indian Pharmacopoeia and started financing a number of investigations in this

connection with the object of working out of the indigenous drugs on scientific lines.

Recently an *Indian Pharmaceutical Codex* has been published under the auspices of Council of Scientific & Industrial Research by Dr. B. Mukerji, Director, Central Drug Research Institute, Lucknow, which gives about 200 monographs and a similar number of formulary giving pharmacognostic, chemical, pharmcological and therapeutic data on indigenous drugs with their preparation and dosage for the medical and pharmaceutical professions.

CHAPTER VI

A RETROSPECT OF RESULTS ACHIEVED

During the period of three or four decades since this work was started, much has been accomplished though only the fringe of this vast problem has yet been touched. A number of important medicinal plants commonly used by the Kabirajes, Hakims and as popular household remedies by the people have been investigated on modern scientific lines. The chemical composition of many plants has been determined, the pharmacological action of the active principles of a large number has been worked out by animal experimentation, and finally suitable preparations made from a number of drugs have been tested on patients in properly equipped hospitals. It is only by such thorough investigations that the real merits of these drugs can be proved and a demand created for them not only in India but in other parts of the world. This laborious work has brought into prominence the merits and qualities of certain drugs and it has been shown that they may prove to be valuable additions to the armamentarium of the medical man to relieve the sufferings of humanity, if brought into general use. Such drugs unfortunately are not many. A few examples may be cited here. *Holarrhena antidysenterica* (Kurchi) has proved useful in the treatment of amoebic dysentery especially the chronic form, *Rauwolfia serpentina* has proved to be an effective sedative which brings down the blood pressure particularly the diastolic. This plant has attracted much attention of the Pharmacologists and clinicians in Europe and America. There are a number of others *Plantago ovata*—Isabgul is an excellent sedative in irritative conditions of the guts; *Adhatoda vasica* is a good expectorant; *Psoralea corylifolia* is useful in leucoderma; *Cissampelos pariera* is likely to be a useful smooth muscle relaxant; *Deamia extensa* as smooth muscle stimulant.

A large number of those examined showed activity more or less the same as drugs already possessed by the pharmacopoeias. These can be brought into use as cheaper indigenous substitutes. Many others were effective enough to be used in the treatment of common minor ailments which form about 80% of total morbidity in this country. A fourth group of drugs which though used in indigenous medicine were found to have little or no activity as judged by our standards. Many drugs of questionable value and doubtful utility crept into the indigenous systems during the period of decay.

Full details of work done in this connection upto the end of 1953 will be found in the 2nd Edition of "*The Indigenous drugs of India*" which is a compendium of information with the regard to the whole subject of indigenous drugs and constitutes a leading work of reference. A Glossary of Indian Medicinal Plants is in the course of publication by the Council of Scientific & Industrial Research. In this book which has involved immense labour, brief reference has been made to scientific name of plants, their common vernacular names, the active principles contained,

the diseased conditions in which they are popularly used and the important references in literature on the work done. This will form a handy volume for those interested in medicinal plants growing in India.

The *Wealth of India* 1949-53 is a very comprehensive treatise which is being published under the auspices of the Council of Scientific & Industrial Research. This book is really a new edition of a Dictionary of Economic Products of India, published in 1895, brought up-to-date. It will eventually come out in many volumes. The first five are already out and do credit to the Editorial Board of Council of Scientific & Industrial Research. In these books the results of investigations of many drugs on the lines indicated above are given.

A list of drugs which have been investigated with a brief summary of work done will be found hereafter. Those which have been shown to be of proved utility are marked with an asterisk.

Value of Negative results. Apart from establishing the value of many useful remedies there is another aspect of this work which should not be neglected in this review. At the present time most of the drugs used in the indigenous medicine are supposed to be specific for some particular diseases and lay people will wax eloquent in their descriptions of the wonderful cures said to have been produced by some of these remedies. Glowing statements of this nature, supported by insufficient evidence, have also some times appeared in medical journals, as in the case of effectiveness of *Vitex peduncularis* in malarial fevers and black water fever. This has done a great deal of harm and distinguished pharmacologists and clinicians of the West are beginning to doubt if there is really anything of much value in the vast array of the materia medica of the indigenous systems of medicine. Many are inclined to take the view that an investigation into the properties of these drugs is not likely to lead to much material results. In this way the reputation of these remedies has grievously suffered in Western medicine, the good ones being indiscriminately classed with the bad. Only systematic research of this kind can establish the value of the useful ones.

It should also be remembered, however, that the indigenous systems of medicine, good, bad or indifferent as they might be, minister to the needs of about 80 per cent of the population of this vast country even at the present time. It is, therefore, the duty of research organisations in this country to investigate the materia medica which are in use in order to prove or disprove their effectiveness and their practical utility in the treatment of disease.

In the following pages a brief summary of the work done on commonly used drugs is given first and then its common vernacular names, habitat, the parts of the plant used in indigenous medicine and the ailments in which they are prescribed. After this the active principles found in the plant, their pharmacological action and results of clinical trials are recorded. Indications are also briefly given of the direction in which further work may be carried out.

Abbreviations used in description of Plants.

Afgh.	...	Afghanistan
B.	...	Bengali
Baluchi.	...	Baluchistan
Baz.	...	Bazar
Bhutia.	...	Bhutan and other Himalayan countries
Bo.	...	Bombay
B. P.	...	British Pharmacopoeia
B. P. C.	...	British Pharmaceutical Codex
Burm.	...	Burmese
Dec.	...	Deccan
H.	...	Hindi
I. P.	...	Indian Pharmacopoeia
I. P. C.	...	Indian Pharmaceutical Codex
I. P. L.	...	Indian Pharmacopoeial List
K.	...	Kanarese
Kash.	...	Kashmiri
Kumaon	...	Kumaon Hills
M.	...	Malayalum
Nep.	...	Nepalese
P.	...	Punjabi
Pers.	...	Persian
S.	...	Sanskrit
Singh.	...	Singhalese
Santh.	...	Santhal
Vern.	...	Vernacular

Abroma augusta Linn. Devils cotton (Vern.—H. & B. Ulatkambal Bo.—Olaktambol). I. P. C.

Grows wild in Uttar Pradesh, Sikkim, Khasia Hills and Assam. Both root and bark are used as emmenagogue in menstrual disorders and as uterine tonic. Fresh viscid sap is used in dysmenorrhea in doses of 30 grains a day. An alkaloid 0.01%, a fixed oil, resins and water solvble basis have been found. Preliminary investigations of the alkaloid and water soluble bases revealed no remarkable pharmacological activity. No proper clinical trials have been carried out.

Abrus precatorius Linn. (Indian or wild Liquorice root) (Vern.—S. & Bo.—Gunja, H.—Gaungchi, B.—Kunch, M.—Gundumani).

Grows wild in plains of India and Ceylon and along the Himalayas up to altitudes of 3,000 ft. Seeds are used as tonic and aphrodisiac. Roots and leaves contain glycyrhizin, an alkaloid abrine, a glycoside abralin and a fatty oil. Preliminary investigations of the alkaloid revealed its marked poisonous properties. No systematic study has been carried out with regard to its therapeutic efficacy.

Aconitum (Vern.—Bachnag)

A paste prepared from the root is used as a remedy for neuralgia and other painful affections. The drug is used in the treatment of fever, rheumatism, cough, asthma and snake-bite.

Aconitum balfourii Stapf. (Vern.-Nep.-Gobari; Darmiya gobriya).

It is found in sub-alpine Himalayas from Gharwal to Nepal at altitudes of 12,000 ft. to 14,000 ft. Root contains total alkaloids 1.2% of which pseudo-aconitine is 0.4%.

Aconitum chasmanthum Stapf. Indian Nepellus (Vern.-Mohri, Kash.-Banbalnag). I. P. L. & I. P. C.

Grows in Western Himalayas of Kashmir at altitudes of 7,000 ft. to 12,000 ft. Root contains 4.3 per cent. of total alkaloids, aconitine being the principal.

Aconitum deinorrhizum Stapf. (Vern.-Safed bikh, Mohra, Maurabikh).

It is found throughout the Central Himalayas from Kumaon to Nepal and Upper Bushahr in Himachal Pradesh. Roots contain total alkaloids 0.9 per cent of which pseudo-aconitine is 0.4 per cent.

Aconitum ferox Wall. (Vern.-S.-Visha, H. & B.-Bish, Bo.-Vachnag, M.-Vashanavi).

It is found in Northern Himalayas, Nepal and Kashmir. Root is used as a remedy for neuralgia and rheumatism and as a sedative, antipyretic and diaphoretic.

Aconitum heterophyllum Wall. (Vern.-Atis, S.-Ativisha, H.-Atis, B.-Ataicha, M.-Ati vadayam).

It grows in sub-alpine and alpine zones of the Himalayas. It is used as a bitter tonic and febrifuge in the treatment of fevers, diarrhoea, dyspepsia, cough and as an aphrodisiac. Roots contain alkaloids atisine 0.4 per cent., heteratisine and hetisin.

Aconitum laciniatum Stapf. (Vern.- Kalo bikhmo),

Grows in the sub-alpine and alpine Himalayas of Sikkim and Tibbet at altitudes of 10,000 to 14,000 ft.

Aconitum spicatum Stapf. (Vern.-Bikh, Kalo bikhoma donghi).

Grows in Nepal, Sikkim, Chumbi at altitudes of 10,000 to 12,000 ft. It is used as a poison. Roots contain 0.4 per cent. of alkaloid named bikhaconitine.

Aconitum violaceum Jacq. (Vern.-Tilia Kachnag.)

Found in alpine zones of the Himalayas from Gilgit to Kumaon at altitudes of 10,000 to 15,000 ft. The alkaloid aconitine is a cardiac irritant. Locally it produces tingling followed by numbness. Internally it slows the heart.

Acorus calamus Linn. (The sweet flag) (Vern.-H. & B.-Bach, Bo.-Vaj, M.-Vashambu). I. P. C.

Native of Europe and North America, but cultivated in India and Burma at altitudes of 3,000 to 6,000 ft. Common in Manipur and Naga Hills. The rhizome is used as emetic, antispasmodic, carminative and expectorant. It is an old remedy against chronic, diarrhoeas Dried rhizome contains 1.5% of an essential oil, starch and tannin. No systematic pharmacological investigations have been carried out.

Actinodaphne hookeri Meissn (Vern.-Pichli, Bo.-Pisa).

Grows in Sikkim and on the eastern and western Ghats. Infusion from leaves is used as a remedy for urinary disorders and oil from seeds is used as an external application in sprains of joints. Bark contains a crystalline alkaloid named as actinodaphnine. Leaves contain amorphous salts and seeds an essential oil (1.0%), fat and a fixed oil. No pharmacological or clinical works have been carried out.

Adhatoda vasica Nees. (Malabar nut tree. Vern.-Arusha, S.-Vasaka, H. & B.-Adulsa, B.-Bakas, M. Adhatodai). B. P. C., I. P. C. & I. P. L.

Grows all over the plains of India and in the lower Himalayan ranges ascending to a height of 4,000 ft. Leaves, roots and flowers are used as a remedy against chronic bronchitis, asthma and pthisis. Juice of leaves is used in diarrhoea, dysentery and malarial fevers. It is also used locally as counter-irritant. It contains an alkaloid vasicine and an essential oil. The alkaloid vasicine has no very marked pharmacological action and produces only slight bronchodilation. The essential oil acts as an expectorant. Fluid extract from leaves relieves coughs. It is said to be effective in asthma and pulmonary tuberculosis. An antibiotic principle having a powerful action on tubercle bacillus has been discovered.

Aegle marmelos Correa (Bael fruit. Vern.-S.-Sriphal, H., B. & Bo.-Bael). B. P. C., I. P. C. & I. P. L.

Grows wild all over sub-Himalayan forests, in Bengal, South India and in Burma. Root, bark, leaves and fruit are used to cure gastro-intestinal disorders. Roots, bark and leaves contain reducing sugars and tannin and fruit contains marmelosin, the most potent active principle. Marmelosin acts as laxative and diuretic in doses of 0.05 gm. Larger doses depress the heart. Extracts made from the fresh or dried unripe fruit are used effectively in treatment of chronic diarrhoeas and dysenteries.

Alangium salviifolium (Linn. f.) Wang. Syn.-*A. lamarckii* Thwaites (Vern.-S.-Ankota, H.-Akola, B.-Akar Kanta, Bo.-Ankola, M.-Alangi).

Grows in forests throughout India and Burma. Root bark is used as an anthelmintic and purgative also as a remedy for leprosy and skin diseases. Bark contains an alkaloid alangin (0.82%) which produces a fall in blood pressure and depression of the heart. Respiration becomes irregular. Parasympathetic mechanism is stimulated. No clinical trials have been carried out.

Allium sativum Linn. (Garlic. Vern.-S.-Lasuna, H. & Bo.-Lasan, B.-Rasun, M.-Vallaipundu). B. P. C. & I. P. C.

Is grown all over India and is used as a spice in cooking. It is considered to be hot and stimulant and useful in fevers, coughs and other debilitating conditions. Externally it acts as rubefacient in skin diseases. It contains a volatile oil (yield from 0.06 to 0.1%), allacin and a crystalline substance isolated from the alcohol-insoluble fraction of the residue. Garlic has an antiseptic action and slightly tonic effect on frogs' heart and a paralysing effect on isolated rabbit intestine. Garlic juice is used as an antiseptic for wounds. It is considered useful in digestive

disorders and respiratory diseases such as pneumonia, pulmonary tuberculosis and bronchitis. Contains a powerful antibiotic principle effective against tubercle bacillus.

Aloe vera ex Linn. (Vern.-Musabbar, S. & B.-Ghrita Kumari, H.-Ghi kanvar, M.-Kattalai). Syn.-*A. barbadensis* Mill. B. P., B. P. C., I. P. C. & I. P. L.

Native of North Africa but grows in East and West Indies, India and China. In India it is found in the dry valleys upto Cape Comorin. It is used as stomachic, purgative and emmenagogue, and in the treatment of piles, rectal fissures and as a poultice for application to inflamed parts. It contains a mixture of glucosides called aloin. It is valuable in the treatment of constipation.

Alpinia galanga Willd. (The greater Galangal. Vern.-H.-Bare kulinjan, B.-Sugandha-vacha, M.-Pera-rattai). I.P.C.

Is a native of Sumatra and Java but commonly found in East Bengal and South India. Rhizome is used in bronchial catarrh and rheumatism; tubers and seeds are carminative and useful for impotence and nervous debility. Root contains compheride, galangin and alpinin. From the green rhizomes a pale yellow oil is obtained. The drug is depressant to cardio-vascular system and stimulates respiration in smaller doses but larger doses depress it. Bronchioles are dialated. It is used as an expectorant in respiratory troubles of children and in asthma, intestinal and biliary colics.

Alstonia scholaris R. Br. (Dita-bark. Vern.-S.-Sapta parna, H.-Chatium, B.-Chhatim, M.-Edakula-pala). I.P.C.

Is cultivated throughout India and found in sub-Himalayan tract upto 3,000 ft. Also found in Bengal and in Southern India. Bark is used as tonic and alterative. It is considered useful in fevers and skin diseases. It contains a bitter principle ditain, alkaloids ditamine, echitamine, and acid and fatty resinous substances. The alkaloids are not protoplasmic poisons. They relax isolated strips of rat intestine. In the intact cat, the alkaloids produce a sharp fall of blood pressure. Larger doses produce irregularities of heart beat. Drug is used in the treatment of malarial fever, chronic diarrhoea and advanced stages of dysentery. Recently shown to have no specific curative action in malaria.

Amomum subulatum Roxb. The greater Cardamom (Vern.-S.-Brihat-upa-kunchika, H. & B.-Bara-elachi, M.-Periya-yelakkay). I.P.C.

Grows in Nepal and Darjeeling Hills. Used for flavouring purposes. Seeds contain an oil rich in cineole.

Andrographis paniculata Nees. (The Creat. Vern.-S.-Bhunimba, H.-Kiryat, B.-Kalmegh, M.-Nila vembu). B.P.C., I.P.C. & I.P.L.

Is found throughout the plains of India from Lucknow to Assam and is also cultivated in gardens in some parts of India. Leaves and juice are used to relieve griping, irregular stools and loss of appetite in children. Roots and leaves are used as febrifuge, tonic, alterative and anthelmintic. Leaves contain two bitter substances and traces of an essential oil. No systematic pharmacological investigations have been carried out. It has an intensely bitter taste.

Antiaris toxicaria Letsh. (The Upas tree. Vern.-Chanduka, Bo.-Chandla, M.-Nettavil, Sing.-Riti, Burm.-Hmyaseik).

Grows in Java, Malaya and Burma. In India it is found in Concan, Canara, Travancore and Coorg. Juice from leaves and bark is used as an arrow poison in Java, Malaya and Burma. Bitter seeds are used as a remedy for dysentery and as a febrifuge in doses of half a seed three times a day. Milky juice of the plant contains antiarol, large amounts of potassium nitrate, antiaresin, a crystalline protein and three glucosides α-antiarin, β-antiarin, γ-antiarin. Preliminary toxicity tests on guinea pigs revealed that the drug is highly poisonous and the M. L. D. is 6 mgm. per kilo body weight. Death occurs due to heart failure. It also produces marked tonic contraction of the isolated and intact intestines. No therapeutic trials have been carried out.

Arachis hypogaea Linn. (Vern.-S.-Buchanaka, H.-Mungphali, B.-Chiner badam, Bo.-Bhui-chane, M.-Nila kadalai). Ground Nut. B.P., B.P.C., I.P.C. & I.P.L.

Originally a native of Brazil but now cultivated in all tropical or sub-tropical countries. India is the largest producer. The seeds are used as food, and oil as nutritive, laxative and emollient. Seeds yield 40 to 50 per cent. of a clear fixed oil which is used as a substitute for olive oil in India, as a basis for liniments and ointments. Also used in the manufacture of soap and cosmetics, leather dressing and as substitute for tallow and diesel oil.

Areca catechu Linn. (The areca or betelnut palm) (Vern.-S.-Gubak, H. & B.-Supari, Bo.-Sopari, M.-Kumugu). B.P.C., I.P.C. & I.P.L.

Grows in Sunda Islands but extensively cultivated in Southern India, Assam and Eastern Archipelago. It is widely used in India and China as anthelmintic in man and animals, and as a masticatory to prevent the decay of teeth. The seed contains alkaloids arecaine 0.1%, arecoline 0.07 to 0.1%, arecaidine, guvacoline, guvacine and choline, tannin 15% and fat 14%. Arecoline is a highly toxic substance and its action resembles muscarine. The seeds are used as anthelmintic in doses of 6 drams and for astringent action in relaxed condition of bowels.

Argemone mexicana Linn. (Mexican Poppy) (Vern.-Bharbhand, Kandiari, S.-Srigala-kantaka, H. & B.-Sialkanta, M.-Birama-dandu).

Grows wild all over India. Juice of plant is used to cure dropsy, jaundice and cutaneous affections. The seeds and seed-oil is used as a remedy for dysentery and intestinal affections. The plant contains alkaloids, berberine and protopine. The seeds yield about 22% of argemone oil which is used as a purgative but has no special advantage over other purgatives. It is used as an adulterant of mustard oil and is believed to produce epidemic dropsy.

Aristolochia indica Linn. (Vern.-S.-Rudrajata, H. & B.-Isharmul, M.-Ichchura-mula). I.P.C. & I.P.L.

Grows all over tropical portions of India, Bengal, Konkan, Travancore and Coromandel Coast. Root is used in the treatment of bowel complaints in children and in fevers. It possesses emmenagogue and anti-arthritic properties. Constituents of the root are an essential oil,

a bitter substance and an alkaloid aristolochin. The alkaloid produces cardiac and respiratory paralysis in frogs and mice. Skeletal muscles are stimulated in small doses. More detailed pharmacological investigations and clinical trials are indicated.

Artemisia Sp. (Vern.—Kirmala)

Grows abundantly in the Himalayas from Kumaon to Kashmir at altitudes of 4,000 to 12,000 ft., also in Baluchistan, Chitral and Afghanistan. Flowering tops are used as anthelmintic in 2 to 4 dram doses. The drug is also used as a remedy for dropsy and as cardiac and respiratory stimulant. It contains a volatile oil, santonin and an allied body—artemisin.

Artemisia absinthium Linn. Wormwood (Vern.-H. & Dec.-Vilayati afsantin).

Grows in Kashmir at altitudes of 5,000 to 7,000 ft. The oil has a tonic and stimulating effect on the digestive system. Contains 0 3 per cent. of an essential oil, a bitter glucoside absinthin and a crystalline compound.

Artemisia dracunculus Linn.

Found in western Tibet at altitudes of 14,000 to 16,000 ft. and in Lahul. Leaves are used for flavouring vinegar and as a spice. They contain about 0.3 per cent. of an essential oil.

Artemisia maritima Linn. (Vern.-S.-Gadadhar, H.-Kirmala, Bo. Kiramani owa). I.P.C. & I.P.L.

Found in Western Himalayas from Kashmir to Kumaon at altitudes from 7,000 to 9,000 ft. in Kashmir, Kurrum, Kagan, Bushher, Waziristan and Chamba.

Artemisia pallens Wall. ex-DC. (Vern.-Davana).

Grows in certain parts of South India in Mysore State and is also cultivated near Poona. Leaves are used as floral decoratives and the oil from the herb is a popular article in perfumery.

Artemisia sacrorum Ledele. (Vern. P.-Tatwen).

Grows in Western Tibet, Kanawar and in Tibetan regions of Kumaon at altitudes of 10,000 to 12,000 ft. Contains 1 per cent. of an essential oil.

Artemisia vulgaris Linn. (Vern.-Tithwan, S.-Nagadamani, H.-Nagadouna, B.-Nagdona).

Grows throughout the mountainous regions of India ascending to an altitude of 12,000 ft., in western Himalayas upto 5,000 to 8,000 ft., in Sikkim and Khasia Hills, also in Mount Abu and Western Ghats. Used as antiseptic expectorant and anthelmintic. Contains 0.2 per cent of a volatile oil which is a good larvicide.

Asteracantha longifolia Nees. Syn.-*Hygrophila spinosa* T. Anders. (Vern.-S.-Kakilakshya, H.-Talmakhana, B. Kuliakhara, Bo.-Talim khana, M.-Vallarai) I.P.C.

Grows commonly in moist places throughout India from Himalayas to Ceylon. Roots are used as cooling, diuretic, stimulating and to remove dropsical fluids and kidney stones. They contain phytosterol, traces of an essential oil, a yellowish green wax, gum and maltose. Seeds contain an oil 23 per cent. and an alkaloid. No pharmacological and clinical studies have been carried out.

Atropa acuminata Royle. (Vern.-Sag-angur) B.P., B.P.C. & I.P.C.

Grows in abundance in the Himalayan ranges extending from Simla to Kashmir, at altitudes of 6,000 to 12,000 ft. In Jammu & Kashmir State, it is found in the forest mountains round Kashmir valley. It is also found in Himachal Pradesh, Kulu, Parbati valleys and Narkanda forests of Simla Hills. Belladonna and its alkaloid atropine are largely used as a sedative, antispasmodic and mydriatic in diseases of the eye, and as antidote in opium and muscarine poisoning. Alkaloids (as hyoscyamine) are present from 0.15 to 0.7 per cent. in the leave sand 0.3 to 0.66 per cent. in the root. Traces of an inactive volatile alkaloid is also present. The plant is now cultivated and large amount of belladonna preparations in India come from this source.

Azadirachta indica A Juss. (Vern.-Nim) The Neem. I. P. C. & I. P. L.

Grows throughout the greater part of India and Burma. Bark and leaves are used as a bitter tonic and astringent. It is considered useful in skin diseases. Fruit is used as purgative, emollient and for expelling intestinal worms. Considered beneficial in urinary diseases and in the treatment of piles. Bark contains an alkaloid margosine and seeds yield a fixed bitter oil. Margosates are toxic to protozoa and bacteria. Clinical trials revealed that the drug has a beneficial effect in skin diseases.

Bacopa monnieri (Linn.) Pennell, Syn. *Herpestis monniera* (Linn.) H. B. & K. (Vern.-S.-Brahmi, H.-Braehmbhi, B.-Brihmisak, M.-Nirbrami) I .P. C.

Grows throughout India on the borders of streams and tanks. Roots, leaf and stalks are used as nerve tonic and as a remedy for insanity and epilepsy. It contains an alkaloid, herpestine, which is highly toxic. It produces a fall of blood pressure and stimulation of respiration. The smooth muscle of intestines and uterus is stimulated. In therapeutic doses it resembles strychnine. Powdered dried leaves gave satisfactory results in cases of asthenia and nervous break down. Further clinical trials are needed.

Bambusa bambos Druce, Syn.—*B. arundinacea* Willd. (Vern.-Kantabans, S.-Vansa, B. & H.-Bans, Bo.-Mandgay).

Grows wild throughout the greater part of India particularly in the hilly forests of Western and Southern India upto an altitude of 3,000 ft. Leaves are considered useful in diseases of blood, leucoderma and

inflammatory conditions. Tabashir found as concretions in it is used against blood diseases, tuberculosis, asthma and leprosy. Seeds contain water 11·0 percent., starch 73.7 percent., albuminoids 11.8 per cent., oil 0.6 per cent, fibre 1.7 per cent. and ash 1.2 per cent. Young shoots contain a cyanogenetic glucoside. No systemmatic work has been done to determine its proper therapeutic efficacy.

Berberis aristata DC. (The barberry) (Vern.-Chitra, S.-Daru haridra H.-Dar-hald). I.P.L. & I.P.C.

Grows in the temperate Himalayas at an altitude of 6,000 to 8,000 ft. A tincture made from root bark was used as a bitter tonic, stomachic, cholagogue, antiperiodic and alterative. Berberine is the chief alkaloid, also umbellatine is present. It is used as diaphoretic and antipyretic in malarial fever but has little specification.

Berberis asiatica Roxb. (Vern.-Sumlu, H.-Kilmora, Nepal.-Chitro). I.P.L.

Grows in dry valleys of the Himalayas at an altitude of 3,000 to 7,500 ft. in Bhutan, Garhwal and Behar. Its uses are similar to those of *B. aristata* and its active principle is berberine.

Berberis coriacea—Brandis (Vern.-Simla-Kashmal). I.P.L.

Grows in N. W. Himalayas at an altitude of 8,000 ft.

Berberis floribunda Hort.

Grows in Nepal. The roots contain eight alkaloids namely Oxycanthine, bebamine, berberine, epierberine, palmatine, dihydrocarydeline, jatrorrhizine and columbamine. No detailed pharmacological studies have been carried out but the action of these alkaloids would appear to resemble berberine.

Berberis himalaica

Found in Bhutan. Bark contains berberine (0·03%), jatrorrhiszine (0.01%) and an alkaloid limanthine. It has not been used in medicine although it belongs to berberis group of plants.

Berberis insignis Hook.

Grows in humid forests of the Eastern Himalayas from Nepal and Sikkim to Bhutan at altitudes of 8,000-10,000 ft. Stem bark contains 1.52 per cent and root bark 2.5 per cent of total alkaloids consisting chiefly of umbellatine.

Berberis lycium Royle. (Vern. H.-Kashmal, Bo.-Darhald).

Grows in the Western Himalayas at altitudes of 3000-9000 ft from Garhwal to Hazara. It is used as febrifuge carminative and aperient and is considered beneficial in piles, enlargement of liver and spleen and as external application to eyelids in conjunctivitis. It contains alkaloid umbellatine.

Berberis umbellata Wall.

Occurs on Himalayan ranges at altitudes from 9,000 to 12,000 ft. from Kashmir eastward to Bhutan. Bark contains Umbellatine which like berberine has a specific inhibitory action on *Lieshmania tropica*. The cardiovascular system is depressed and para-sympathetic nervous system is stimulated. Respiration is depressed.

Berberis vulgaris Linn. (The true barberry) Vern. Zirishk, P.-Kashmal). I.P.L.

Grows in the Himalayas from Nepal westwards at an altitude of over 8,000 ft. It is used as diuretic, astringent and refrigerant. In small doses it acts as a tonic and in large doses as a purgative. It contains berberine which has an inhibitary action on *leishmania*.

Blepharis edulis Pers. (Vern.—H.-Utanjan, Bo.-Utangan).

Grows in the Punjab and Baluchistan. Leaves used as astringent in bowel complaints. It has aphrodisiac and alterative properties. It is useful in fevers, urinary discharges and leucoderma. Seeds contain a bitter glucoside belapharine (1.2 per cent.) and dl-allantoin (2.1 per cent.) No detailed pharmacological studies have been carried out.

Boerhaavia repens Linn. (Vern. Thikri, S.- Shothaghni, H.-Sant, B.-Punarnaba, Bo.-Ghetuli, M.-Mukuk-rattai). B.P., I.P.C. & I.P.L.

Grows all over India. It is used as laxative and diaphoretic in oedema, anaemia, heart disease, cough and intestinal colic. It contains an alkaloid named punarnavine and an oily amorphous matter. Sulphates, chlorides, nitrates and chlorates occur in ash. The alkaloid is not toxic. It has a diuretic effect and raises blood pressure. The movements of intestines are depressed. The liquid extract in doses from one to four drams produces definite diuresis in patients with oedema and dropsy.

Bragantia wallichii R.Br. (Vern.—Chakrani).

Grows in southern half of Bombay State near the Coast, Madras and Ceylon. Used to cure chronic sores and ulcers. Considered useful in cholera and diarrhoea. Roots contain a fatty oil and a yellow substance identical with isoaristolochic acid. No pharmacological studies or clinical trials have been carried out.

Butea monosperma Lam.-Kutze. (Vern. Palas). I.P.C.

Grows throughout India and Burma extending in the N. W. Himalayas as far as Jhelum. Gum (Kino) is used as astringent, diuretic and aphrodisiac. Seeds are used as an anthelmintic and contain 18 per cent. of a fixed oil, small quantities of resin and large amounts of water-soluble albuminoids. The oil does not possess any marked anthelmintic action. No systematic investigation has been carried out.

Butea superba Roxb. (Vern.-Palarvela, S. Lata palas, H. & B.-Paas lata, M.-Kodi-murukkan).

Grows in the forests of Oudh and Bundhelkhand, Chotanagpur, Central and Southern India. It is used as a remedy against eruptions in children. Decoction of stem and leaves is emollient and is used as a

local application for piles. Root contains an esterogenic substance and a poisonous substance. Flowers contain butrin, butein and butin. An aqueous extract equivalent to 0.002 per cent. of the dried powder causes estrus in spayed female mice. Further pharmacological studies are indicated.

Caesalpinia crista Linn. Syn.- *C. bonducella* Fleming. Fever nut. (Vern.-S.-Kuberakshi, H.-Kat-karanj, B.-Nata-karanja, Bo.-Sagaragoth, M.-Gajega). I.P.C.

Grows near the sea-coast, all over Bengal, Bombay and S. India. Seeds, leaves and roots are used as anthelmintic, emmenagogue and febrifuge. Seeds contain starchy matter, a bitter principle called bonducin and an oil. The plant is not of much therapeutic value.

Calotropis gigantea Linn.- (Gigantic swallow root) (Vern. Ak-Madar, S.-Arka, H.-Ak., B. & Bo.-Akanda, M.-Erukku). I.P.C.

Grows in waste lands all over India upto altitudes of 3,000 ft. Milky juice is used for tanning and dyeing purposes. An intoxicating liquor is prepared from the juice. Latex contains water soluble matter 86 to 95.5 per cent. Stem bark contains calotropeolis, B-amyrin and giganteol. No marked therapeutic value.

Calycopteris floribunda Lam. (Vern. H.-Kokoranj, Bo.-Ukshi, M.-Marsada boli).

Grows in Central and Southern India in plains and upto an altitude of 2,500 ft. Leaves used as laxative, anthelmintic and the juice given in puerperal fevers. Also used in the treatment of dysentery and malarial fevers. The juice contains, chlorides, sulphates, nitrates, lime, ferric oxide, tannin, albuminoids and gummy matter. Leaves contain a yellow crystalline flavone, calycopterin. The drug is toxic to fish and earthworms ; more toxic to earthworms than santonine or chenopodium oil. No detailed pharmacological and clinical investigations have been carried out.

Camellia sinensis Linn. (O. Kunfize) Vern.-Cha. Tea plant B.P. & B.P.C.

In India, tea and coffee grow luxuriantly. Coffee is grown principally in Madras, Coorg, Mysore, Travancore and Cochin. Tea is also found in Ceylon and is grown in Assam, Bengal, Madras and Travancore. Tea is used as a beverage in India and other parts of the world. Tea leaves contain from 2.5 to 3% of Caffeine. Coffee contains 1.5 per cent. of caffeine. Caffeine is used in medicine for stimulation of central nervous system and circulation and as a diuretic.

Cannabis sativa Linn. (*Cannabis indica*) (Vern. S.-Ganjika, H. & Bo.-Ganja, M.-Bhangi, Bhang). B.P.C., I.P.C. & I.P.L.

Grows wild throughout the Himalayas from Kashmir to East of Assam and also in Southern India. Plant and its products are used for narcotic purposes, by smoking or taking internally. It contains a terpene 1.5 per cent., a sesquiterpine 1.75 per cent., small amount of paraffin carbon and a resin named as Cannabinol (33 per cent.). Hemp drugs are consumed all over the world for euphoric purposes. Their use alleviates the feeling of fatigue, encourages sleep and soothes restlessness.

Sensation of time and space is lost. Larger doses produce mental derangement and even insanity.

Carica papaya Linn. (The Papaya) (Vern. Papita, H.-Papaya, B.-Papey, Bo.-Papai, M.-Pappayi). B.P., B.P.C., I.P.C. & I.P.L.

Grows all over India and is used as anthelmintic, emmenagogue and digestive. The fruit pulp contains sucrose, invert sugar, resinous substance, papain, malic acid, salts of tartaric and citric acids and vitamins. Seeds contain, proteins, carbohydrates, fatty oil, volatile oil, an alkaloid carpaine, a glycoside carposide and an enzyme myrosin. Carpaine is a heart poison, it lowers blood pressure and depresses heart. No proper clinical trials have been carried out.

Carum carvi Linn. The Caraway seed (Vern. Zira, H.-Shiajira, B.-Jira, M. Shimai-shombu). B.P., B.P.C. & I.P.C.

Widely distributed in the temperate regions of both the hemispheres. Grows in North and Central Europe, extending to the Caucasus, Persia, Tibet and Siberia. In India it is cultivated on the hills of Baluchistan, Kashmir, Kumaon, Gharwal, Chamba at altitudes of 9,000 to 12,000 ft. Used as a cookery condiment. Oil is used for flavouring purposes and as a carminative. Seeds contain an essential oil with a marked carminative action.

Cassia absus Linn. (Vern. H.—Chaksu, N —Karun Kanam).

Grows in lower parts of the Western Himalayas and Ceylon. Leaves are applied locally to tumours and internally in cough, asthma and bronchitis. Seeds are used as bitter, astringent and diuretic and contain two water soluble bases, chaksine and Isochaksine, as carbonates (1.5 per cent.). Premliminary studies show, that chaksine sulphate is depressant to heart, respiration and nerve centres. More detailed studies are indicated. Considered useful in eye diseases. No clinical trials have been carried out.

Cassia angustifolia Vahl. (Vern. H.-Hindisana, B.-Sonamukhi, M.-Nila vakai). B.P., B.P.C. & I.P.C.

Cultivated in S. India in Madras State (Madura). Leaves and pods are used as purgative. Leaves and pods contain cathartic acid, emodin and chrysophanic acid. Senna is useful in habitual constipation. It increases the peristaltic movements of the colon. The tendency to gripe is overcome by mixing it with aromatics.

Cedrela toona Roxb. (Vern. Mahalimbu, S. & B.-Nandibriksha, H.-Tun, Bo.-Tuni, M.-Tunumaram, P.-Khushing).

Grows in Sub-Himalayan tracts from river Indus eastwards, Chittagong, Assam, Burma, Chotanagpur, Western Ghats of Bombay to the Nilgiris and other hills of the Deccan Peninsula. The plant is used as astringent in the treatment of ulcers, gleet and scabies. Flowers are used in menstrual disorders and contain a red colouring matter, nyctanthin, flavone and a glucoside. Bark contains, tannic acid, a bitter resin, citric acid and starch. No pharmacological or clinical investigations have been carried out.

Celastrus paniculatus Willd. (Vern. S.-Kanguni, H.-Malkanguni, M.-Valuluwai).

Grows in Sub-Himalayan tracts extending from Jhelum to Assam ascending to an altitude of 6,000 ft. and in hilly parts of Bombay State, South Gujrat, Central India and Madras. Seeds and oil are used in the treatment of rheumatism, gout, paralysis and epilepsy. Oil is considered as nerve stimulant and brain tonic. Leaves contain an alkaloid, a glucoside and colouring matter. Seeds contain 52.2 per cent. of a thick brownish oil. No pharmacological studies have been carried out.

Centella asiatica (Linn.) Urban. Syn.-*Hydrocotyle asiatica* Linn. (Vern.-Brahmi, S.-Vanduka parni, H.-Brahmo manduki, B.-Tholkuri, Bo.-Karivana, M.-Vallarai). I. P. C.

Grows throughout India from Himalayas to Ceylon at an altitude of 2,000 ft. Plant is used as tonic and is considered beneficial in diseases of the skin, nervous system and blood. Also used in the treatment of leprosy and syphilitic affections. It contains an alkaloid, hydrocotyline and fresh leaves contain a glucoside asiaticoside. Hydrocotyle is shown to be a circulatory stimulant. Further work is indicated.

Centratbrum anthelminticum Kuntze, Syn.-*Vernonia anthelmintica* Willd. (Vern.-S., H. & B.-Somaraj, Bo.-Kalijiri, M.-Kattu-Shiragam). I. P. C. & I. P. L.

Is found in waste lands near villages throughout India. The seeds are used as a remedy for leucoderma and other skin diseases, and as anthelmintic. They contain a bitter principle 1 per cent, a fixed oil 18 per cent and a small amount of an essential oil. No systematic pharmacological investigations have been carried out. Clinical trials revealed that it is effective in thread-worm infections. Further work is needed.

Cephaelis ipecacuanha A. Rich. Syn.-*Psychotria ipecacuanha* stokes. B. P., B. P. C. & I. P. C.

Grows wild in Brazil. In India it has been cultivated in South India and Bengal—in Darjeeling hills. Contains emetine and other alkaloids used in the treatment of amoebic dysentery.

Cerbera odollam Gaertn. Syn.-*C. manghas* Linn. (Vern. B.-Dhakur, M.-Katarali).

Grows all over India particularly in salt swamps in the Malabar Coast, Ceylon and Burma. Plant is intensely poisonous. The leaves and sap have emetic and purgative properties. Seeds contain three glycosides named as cerberin, odollin and cerbeside. Cerbrin is non-irritant to the skin and mucous membranes and produces vomiting, diarrhoea and even syncope when given subcutaneously. Stimulates cardovascular system and smooth muscles. Further clinical trials and experimental work is indicated.

Chenopodium ambrosioides Linn. B.P., B.P.C., I.P.C. & I.P.L.

Grows in Central America, East Indies. In India found in Bengal, Sylhet, the Deccan (Coimbatore). Infusions from leaves and seeds used as a remedy against intestinal worms. Seeds contain a volatile. oil which

contains ascaridole from 45 to 70%. Small portions of glycol-anhydride, mixture of hydrocarbons and traces of fatty acids also occur. Clinical trials have shown its efficacy against hookworms and round worms.

Chenopodium botrys Linn.

Grows in the Himalayas from Kashmir to Sikkim. Used as a substitute for *C. ambrosioides*. Contains a volatile oil 0.03 to 0.04 per cent.

Cichorium intybus Linn. (Vern.-Kasni).

Grows in North Western India and is cultivated in Nadiad, Broach and Amalsad in Bombay State. Used as fodder. Cultivated sweet variety is considered beneficial in acne, opthalmia and throat inflammations. Roots used as diuretic and to enrich and purify blood. Wild variety used as emmenagogue and to cure asthma. Plant contains a glucoside cichorin. Seeds contain, a semi-drying oil, water, gum, glucose, bitter substances, inulin and fibre. No systematic studies of its therapeutic action carried out.

Cinchona. Cinchona bark. B.P., B.P.C., I.P.C. & I.P.L.

Cinchona grows on the Eastern slopes of Central Western chain of the Andes mountains in South America, at altitudes of 2,500 ft. to 9,000 ft. It is cultivated in India in the Nilgiris Hills, Mungpoo in Ranchi Valley and the Karen Hills in Burma. The bark contains quinine, cinchonidine, quinidine and cinchonine. It is used in the treatment of malaria.

Cinnamomum Blume.

Grows in Asia and Australia. About 20 species occur in India. Used as an aromatic and spice.

Cinnamomum camphora Nees. B.P., & B.P.C.

Cultivated in India at Dehradun, Saharanpur, Calcutta, Nilgiris and Mysore.

Cinnamomum zeylanicum Breyn. (Vern.—Dalchini, S.-Gudatreaka) B.P., B.P.C. & I.P.C.

Grows wild on Western Ghats from Konkan southwards and in forests of Tenasserim in Burma. Found abundantly in Ceylon. Used as carminative, astringent, stomachic, flavouring agent and as a spice. Bark contains an essential oil 0.5 to 1%. Leaves yield a dark coloured oil 1%.

Cissampelos pareira Linn. (Vern.—Akanadi, S.-Patha, H. & B.-Nirbisi). I.P.C.

Grows throughout tropical and sub-tropical parts of Asia, East Africa and America. Root is used to relieve pain and is considered useful in febrile conditions, dysentery, heart troubles and urinary disorders. Contains an amorphous alkaloid named pelosine, saponin and ammonium salts; also hayatin and hayatinin. Hayatin methiodide, methochloride have curariform activity equal to tubocurarine chloride. They produce fall of blood pressure which is prevented by antihistaminic drugs. Further studies are in progress. A plant likely to be of great therapeutic value.

Citrullus colocynthis Schrad. (Vern.—Indrayan, S.-Indra-varuni, H. & Bo-Indrayan, B.-Makhal, M.-Peyt-tumatti). B.P., B.P.C. & I.P.C.

Grows in arid tracts of N. West, Central and South India and is met with in the Punjab, Sind and on the Coromandel coast. Fruit is used as cathartic to relieve biliousness and constipation, used in treatment of fever and intestinal parasites. Plant contains a bitter principle colocynthin and traces of an alkaloid. Used in medicine as a drastic purgative.

Citrus aurantii-folia (Christm) Swingle. Syn -*C. medica*, var. *acida*. The Lime Tree.

Citrus limon (Linn.) Burm. f. *Syn.-Citrus medica*, var. *limonis*. The Lemon Tree. B.P., B.P.C., I.P.C. & I.P.L.

Lime and lemon are found growing wild in the warm valleys of the North West Himalayas. Also largely cultivated in the plains and up to altitudes of 4,000 ft. Used as flavouring agent in medicine and also as a carminative and stomachic. Peel contains an essential oil and juice citric acid upto 5.9 per cent.

Cleome icosandra Linn. (Vern.—Aurhur).

Grows throughout India but commonly found in Bengal and S. India. Seeds are used as anthelmintic, rubificient and vesicant. They contain a fixed oil (36.59 per cent.) and a new flavone called 'Viscosin'. No work on its pharmacological action and therapeutic properties has been carried out.

Clerodendron infortunatum Linn. (Vern.—H. & B.-Bhant, Bhat)

Grows in waste lands throughout India and in damp forests of Ceylon, upto an altitude of 5,000 ft. Used as a vermifuge, anthelmintic and a substitute for Chireta. Leaves contain ash 8.04 per cent., protein 21.1 per cent., crude fibre 18.84 per cent., total sugars 17.05 per cent. and a bitter substance clerodin. The last named has no haemolytic and bactericidal action. It is toxic to earthworms, small fish and mosquito larvae. No clinical trials carried out.

Coccinia cordifolia Cogn. Syn.- *Cephalandra indica* Naud, (Vern.-S.-Bimba, H.-Kanduri-ki-Bel, B.-Telakucha. Bo.-Bhimb).

Grows wild in Bengal and other parts of India. It is said to have antidiabetic properties. It contains an enzyme, a hormone and traces of an alkaloid. Did not show any action on blood sugar in animals nor by clinical trials in diabetic patients.

Colchicum luteum Baker (Vern.—Surinjan). I.P.C. & I.P.L.

Grows extensively in the Western temperate Himalayas, extending from Murree hills to Kashmir and Chamba. Used as an alterative and aperient in gout, rheumatism and diseases of liver and spleen. Bitter variety contains alkaloid colchicine, starch and oily resinous matter. Galenical preparations of the crude drug and the alkaloid colchicine are used in the treatment of gout. Recently colchicine has been widely used in plant breeding to induce polyploidy.

Commiphora mukul Engl. (Gum gugul) (Vern.-S.-Guggulu, H.,B. & Bo.-Guggul, M.-Gukhulu).

Grows in Rajputana, Khandesh, Sind, East Bengal and Assam. The gum resin from bark is used as demulcent, aperient, carminative and alterative and is useful in leprosy, rheumatism, syphilitic disorders, nervous and skin diseases and urinary disorders Gum resin contains 32 per cent. gum, 19.5 per cent. mineral matter and 1.45 per cent. of an essential oil. The pharmacological action of this oleoresin resembles the action of copaiba and cubebs. Taken internally it acts as bitter, stomachic and carminative. It also acts as diaphoretic, expectorant and diuretic. It is said to be uterine tonic and regulates menstrual functions. No proper chemical trials have been carried out.

Coptis teeta Wall. (Vern. H.-Mamira, B.-Tita, Bo-Mahmira) I.P.L.

Grows in upper Assam. It is used as an eye salve in indigenous medicine. Active principles berberine ·8.5 per cent., coptine (0.08 per cent.), palmatine (traces), coptisine 0.02 per cent. and jatrorrhine (0.01 per cent.). It is used as a bitter tonic in the same way as Calumba.

Coscinium fenestratum Colebr. (Vern.—Haligach, S.-Daru haridraka, B.-Haldi-gach, M.-Mara-manjal). I.P.C.

Grows in the forests of Western India and is used as a bitter tonic. It contains berberine.

Crocus sativus Linn. (Vern.—Kesar, Safran, S.-Kumkuma, H. & Bo.-Jafran, M.-Kungumapu). B.P.C., I.P.C. & I.P.L.

Is commonly found in Kashmir and Quetta and also cultivated in Spain. It is considered to be stomachic, stimulant, antispasmodic and aphrodasiac. It is used as flavouring and colouring agent in cookery. It contains three crystalline colouring matters, α-crocetin, β-crocetin, γ-crocetin, a fatty oil, a volatile oil and a bitter substance. The essential oil has the characteristic features of other essential oils. No proper clinical trials have been carried out.

Curcuma longa Linn. Syn.-*C. domestica* Valeton. (Vern.—S.-Haridra, H.-Haldi, B.-Halood, Bo.-Halada, M.-Munjal). B. P. C. & I. P. C.

Grows throughout Southern parts of Asia, in India, China and East Indies. Also cultivated in almost all the States of India, particularly in Madras, Bengal and Bombay. Used as a spice. Hakims use it as a stomachic, tonic and blood purifier. The juice of rhizome has antiparasitic action in affections of skin. Rhizome contains an essential oil 5.8 per cent., protein, mineral matters, carbohydrates, and vitamin A. The oil has slight anti-bacterical properties. Taken internally it has antacid action and relaxes the intestines. Used as a stomachic and carminative.

Curcuma zedoaria Rosc. (Vern.—S.-Sati, H. & Bo.-Kachura, B.-Shori, M.-Pulan-ki-zhanga).

Grows in Eastern Himalayas and Kanara, Ceylon and China. It is also cultivated in many Indian States. Rhizomes are used as aromatic, stomachic, stimulant and carminative. Externally applied on bruises

and sprains. Contains an essential oil 1.5 per cent., starch 82.6 percent., ash 1.01 per cent and moisture 13·1 per cent. The essential oil is carminative and produces relaxation of the intestines.

Cuscuta reflexa Roxb. (Vern.—S.-Amaravela, H.-Akasbel, B.-Algusi, Bo.-Nirmuli, M.-Sitama-purgonalu).

Grows throughout the plains of India upto an altitude of 5,000 ft. Used as carminative, purgative, diuretic and purifier of blood. Seeds contain a bitter substance, a glucosidal resin and quercetin. Plant also contains, cuscutin, cuscutalin, brown wax and reducing sugars. No pharmacological studies have been carried out.

Daemia extensa R.Br. (Vern.—S.-Phala kantak, H.-Utran, B.-Chagulbanti, Bo. & M.-Utarni). I.P.C.

Grows throughout the hotter parts of India upto an altitude of 3,000 ft. Used as cooling, anthelmintic, laxative and antiperiodic. Considered useful in eye troubles, uterine disorders and urinary troubles. The plant contains 2.4 per cent of inorganic salts, a bitter resin, and three bitter substances. Bitter principle C is the most active pharmacologically. Has a stimulant action on uterus, intestines, due to direct action on the involuntary muscle. Further pharmacological studies are in progress.

Datura stramonium Linn. (Vern.—B.-Sada dhutura, P.-Tattu dattura, M.-Umatai) B.P.,B.P.C. & I.P.C.

Grows throughout the temperate Himalayas from Kashmir to Sikkim. Used as intoxicant, emetic, digestive and as antispasmodic in asthma and whooping cough. Seeds and leaves contain hyoscyamine, atropine and hyoscine. Datura possess properties similar to belladonna.

Dichora febrifuga Lour. (Vern.—H.-Basak, Nep.-Aseru).

Grows in the temperate Himalayas from Bhutan to Khasia hills, at altitude of 4,000 to 8,000 ft.; also in Upper Burma, Malayan Peninsula and China. Roots are used to cure malaria in China and as a febrifuge in India. Roots and leaves contain two alkaloids, febrifugine and Isofebrifugine. Clinical trials have revealed that the drug has antipyretic action like quinine (1.5 times) but no anti-parasitic action. Further work is indicated.

Didymocarpus pedicellata R. Br.

Grows in subtropical regions from Chamba to Kumaon at altitude between 2,500 and 5,000 ft. Leaves are used as a remedy for stones in kidney and bladder. The plant contains pedicin 1 per cent., iso-pedicin 0.4 per cent., pedicinin 0.3 per cent. and pedicellin 1 per cent. which are crystalline. No detailed pharmacological and clinical trials have been carried out.

Digitalis lanata Ehrh. Grecian Foxglove. B.P., B.P.C. & I.P.C.

Grows in Kashmir at altitudes about 7,000 ft. Fresh leaves contain 3 natural glucosides lanatosides A, B & C which on hydrolysis give digitoxin, gitoxin and digoxin. Digoxin produces the same cardiac effects as digitalis. It is 300 times more potent than prepared digitalis

and is of particular value for rapid digitalization. Digitalis increases the force of systolic contractions and efficiency of the decompensated heart. Slows the heart rate and reduces cardiac œdema with diuresis.

Digitalis purpurea Linn. Foxglove. B.P., B.P.C. & I.P. C.

Cultivated or found as an escape in hilly regions at altitudes of 5,000 – 6,000 ft. Originally a native of Western Europe but now extensively grown in many parts of the world. In India, it is found in Kashmir Himachal Pradesh, Darjeeling area and other parts. It is used as a myocardial stimulant in congestive heart failure. Used as a heart tonic and diuretic. Contains several glucosides but the leaves contain digitoxin, gitoxin and gilatin.

Dregea volubilis Benth. ex Hook. (Vern.—S.-Madhu malati, H.-Nakchikni, B.-Titakunga, Bo.-Dodhi, M.-Kodicpalay).

Grows wild in Assam, Bengal, Deccan, Peninsula from Konkan southward to Ceylon. The plant is used to cure piles, leucoderma, asthma and urinary discharges. It contains a substance of glucosidic nature with low toxicity and traces of an alkaloid. It stimulates all organs having cholinergic nerve supply and causes a prolonged fall of blood pressure. Further work is indicated.

Eletttaria cardamomum Maton. (Vern.—S.-Ela, H. & B.-Choti-elachi, Bo.-Elachi, M.-Ellakai). B.P., B.P.C., I.P.C. & I.P.L.

Grows in Western and Southern India in the forests of Kanara, Mysore, Coorg, Wynaad, Travancore, Cochin. Also found wild in Burma, Ceylon, China and Malaya Archipelago. Used as a spice and masticatory and in medicine as carminative and flavouring agent. Seeds contain an oil to the extent of 2 to 8 per cent.

Entada phaseoloides (Linn.) Merr. Syn.-*E. pursaetha* DC., *E. scandens* Benth.

Grows in Central and Eastern Himalayas at altitudes of 4,000 ft. and is also found in damp forests of Eastern Bengal, Bihar, Orissa, Eastern and Western Ghats. Seeds are used as soap to wash hair. Locally it is applied to swellings ; it is a fish poison. Seeds contain two saponins, entada-saponin A & B and 8 per cent. of a fixed oil. Both saponins are toxic to rabbits and guinea pigs. They produce hæmolysis of red blood cells and a depressant action on circulatory and respiratory systems. Movements of smooth muscles are inhibited. No clinical trials have been carried out.

Ephedra gerardiana Wall. Syn.-*E. vulgaris*. and allied sp. (Vern. Amsania) B.P.C., I.P.C. & I.P.L.

All species grow in Northern India, Bashahr Division, Chakrata, Kangra, Kulu, Baluchistan, Kashmir, Hazara, Kagan and Waziristan. Contains ephedrine and pseudo-ephedrine. Ephedrine is a useful remedy for asthma. Tincture of Ephedra is an excellent cardiac stimulant in toxic conditions.

Erythroxylum coca Lam. B.P. & B.P.C.

Originally a native of South America but is grown in the West Indies, India, Ceylon and Java. Leaves used for euphoric purposes and

contain cocaine to the extent of 0.15 to 0.8 per cent. and other alkaloidal substances. Cocaine is used for local anaesthetic purposes and also as a euphoric.

Eucalyptus L. W. Erit. (Vern.—Karpura Maram) Blue gum tree. B.P., B.P.C., I.P.C. & I.P.L.

Grows naturally in Australia but cultivated in other parts of the world. The oil from leaves is used in soap industry and as an antiseptic and disinfectant. Leaves and terminal branches yield an essential oil.

Eugenia aromatica Kuntze. Syn.-*Caryophyllus aromaticus*. (Vern. Long) B.P. & I.P.C.

Native of Malacca Islands and is largely cultivated in Zanzibar, Pemba, the Amboyna Islands, Penang, Madagascar, Seychelles, Reunion, Mauritius and Ceylon and Southern India. Dried buds contain an essential oil and are used as aromatic stimulant and carminative.

Euonymus tingens Wall. (Vern.—Barphali, H.-Kungku) (Dogwood) I.P.C.

Grows in tropical regions of Asia, Malaya, Europe and America. Used to stimulate torpid liver producing flatulence and indigestion.

Euphorbia hirta Linn. Syn.-*E. pilulifera* Linn. (Vern.—H.-Dudhi, B.-Bara keru, Bo.-Nayeti, M.-Amumpatchaiarissi). B.P.C. & I.P.C.

Grows all over the hotter parts of India. It is used as a remedy for respiratory troubles, dysentery, colic and worms in childern. It contains gallic acid, quercetin, traces of an alkaloid and an essential oil. The extract possesses depressant action on heart and respiration and produces relaxation of bronchioles. It is used to relieve asthma and other spasmodic conditions of the respiratory tract.

Ferula foetida Regel. (Vern.—S.-Hingu, H. & B.-Hing, Bo.-Kayam) Asafoetida. B.P.C., I.P.C. & I.P.L.

Found in Turkestan. Gum resin used as a carminative, antispasmodic and as flavouring agent in spices. Contains a volatile oil, resin, gum and impurities. Used in medicine as carminative and antispasmodic in nervous disorders of childern and women.

Foeniculum vulgare Mill. (Vern.—S.-Madhurika, H.—Bari-saunf, B.-Pan-mauri, Bo.-Bari sopha, M.-Shombu). B.P., B.P.C., I.P.C. & I.P.L.

Cultivated throughout India and also in cold places upto an altitude of 6,000 ft. Used as aromatic, stimulant and carminative. Fruit contains a volatile oil with pleasant aromatic odour, chief constituent of which is anethol but small quantities of substances like fenchone are also present.

Gaultheria fragrantissima Wall. (Vern.—Jar Gandapuro). Indian winter green. I.P.C. & I.P.L.

Grows freely in the Nilgiris, Travancore and Assam. Oil of winter green used as an external application for rheumatic affections, sciatica,

neuralgia and as a flavouring agent in tooth pastes, etc. Leaves contain an oil which mainly consists of methyl-salicylate.

Glycyrrhiza glabra Linn. (Vern.—S.-Yashti-madhu, H.-Jethimadh, B. & Bo.-Jashti madhu, M.-Atimaduram) B.P., B.P.C. & I.P.C.

Found in sub-Himalayan tracts from the Chenab westwards, Burma and the Andaman islands. Used as a tonic, demulcent in catarrh of respiratory treat and genito-urinary passages and as laxative. Roots contain a tribasic acid glycyrrhizic acid and potassium and calcium salts, glucose, sucrose and fat 0.8 per cent. Used in medicine to cover the acrid taste of many nauseous drugs.

Gymnema sylvestre R. Br. (Vern.—Gur mar, S.-Meshasringi, H. & B.—Merasingi, Bo.-Kavali, M.-Shiru kurunja).

Grows in Central and Southern India and in Tropical Africa. It is used as stomachic, diuretic, antiperiodic, antidiabetic and in urinary disorders. It contains resins, a glycoside named as gymnemic acid, a bitter principle and some tartaric acid and calcium oxalate. Experiments on animals showed no reduction of blood sugar. The leaves stimulate heart and circulatory system and increase urine secretion. Clinical trials showed no effect on blood or urine sugar of diabetic patients.

Helicteres isora Linn. (Vern.—Kapasi) The East Indian screw tree.

Is found throughout Central and Western India. It is chiefly used in intestinal disorders such as colic, flatulence and diarrhoea. It contains a demulcent substance and tannins. The pods are used even today in some parts of India in the treatment of chronic diarrhoeas but clinical trials showed no marked action.

Hemidesmus indicus R. Br. (Vern.—S.-Ananta, H.-Magrabu, B.-Anantamul, M.-Nannari). Indian Sarsaparilla. I.P.C.

Grows in Northern India, common in Bengal and in the Deccan, extending to Travancore and Ceylon and Bombay State. Used in the treatment of nutritional disorders, syphilis, chronic rheumatism skin affections and as a blood purifier. Roots contain a steroptene, an essential oil, sterols, resin, tannin and small amount of glycosides. Clinical trials show that its medicinal value is in no way inferior to imported Sarsaparilla.

Holarrhena antidysenterica Wall. (Vern.—Dhudi, S.-Kutaja, H.-Karchi, B.-Kurchi, Bo.-Pandhrakura, M.-Kashappuvetpalarishi). B.P., B.P.C., I.P.C. & I.P.L.

Grows throughout India upto an altitude of 3,500 ft. and even as far south as Travancore. Bark and seeds are used as a powerful antidysenteric, astringent, febrifuge, anthelmintic, carminative and aphrodasiac. Bark and seeds contain kurchine, conessine, kurchicine and holarrhine. Conessine is toxic to protozoa and is locally irritant. The circulatory system is depressed and intestinal movements are stimulated; it has narcotic action on frogs. The total alkaloids have similar action. The extract from bark (containing one grain of total alkaloids in 4 c.c.) given in doses of 2 drams 3 times a day has beneficial effect in amoebic dysentery especially the chronic form. It has proved effective against trichomona infestations.

Holarrhena febrifuga Klotizseh.

Grows in Kenya, Tanganyika, Northern Rhodesia and Nyasaland. Used in the treatment of influenza, bilharzia, syphilis and also as substitute for quinine. Stem bark and leaves contain conessine 6.0 per cent and a subsidiary norbase isoconessiomine. Further studies indicated.

Hydnocarpus anthelmintica Pierre.

It grows in Siam, Northern Cochin and Gamboja.

Hydnocarpus wightiana Blume. (Vern.—Janglibadam, Kowti, Bo.-Kava, M.-Yetti). B.P., I.P.C. & I.P.L.

Grows in western parts of the Indian Peninsula from South Konkan along the coastal range. The oil has been used in the treatment of leprosy for centuries. Seeds contain Chaulmoogra oil and Palmitic acid. Chaulmoogra oil has a bacteriostatic action on acid fast bacilli. It is extremely irritant to the tissues and for this reason ethyl esters such as moogrol (British) and Antileprol (German) are used by injection in the treatment of leprosy.

Hyoscyamus niger Linn. (Vern.—S.-Parasikaya, H.-Khurasani-ajvayan), B.-Khorasani ajowan, Bo.-Khorasani-owa, M.-Khorasani-yomam). B P., B.P.C. & I.P.C.

Grows wild in temperate Himalayas at altitudes of 6,000 to 12,000 ft. and also cultivated. Leaves contain alkaloids hyoscine and hyoscyamine.

Ipomoea hederaceae Jacq & **I. turpethum** Br. (Vern.—H., B. & Bo.-Kaladana, M.-Jirkivirai) B.P.C., I.P.C. & I.P.L.

Found throughout India ascending to altitudes of 3,000 ft. The resinous substance from the root bark is an excellent substitute for Jalap which is a drastic purgative. It is official in the I.P.L.

Juniperus communis Linn. (Vern. H.-Aaraar, P.-Petthri). I.P.C.

Found in the Western Himalayas, Kumaon and Kurram valleys at an altitude of 11,000 ft. above the sea level. It is used as digestive and diuretic. Berries contain a voltaile oil 0.2 per cent., invert sugar about 33 per cent., resin 10 per cent., a bitter principle, organic acids and wax. Beverage gin is alcohol flavoured with juniper berries or the essential oil.

Luffa acutangula Roxb. (Vern. S.-Koshataki, H. & Bo.-Torai, B.-Jhinge, M.-Pikumkai).

Grows in N. W. India, Sikkim, Assam and East Bengal and also cultivated. Leaves used locally in splenitis, haemorrhoids, leprosy and granular conjuctivitis. Fruit contains a bitter substance luffein and seeds contain a fatty oil and a saponin. The latter is toxic to frogs and has a haemolytic action. It shows digitalis-like action and produces vomiting and diarrhoea. Further work is indicated.

Luvunga scandens Ham. (Vern.—Jivanti, S.-Lavangalata, B.-Labangaphal).

Grows in Eastern Bengal, Assam, Khasia hills, Chittagong & Burma. Roots and berries are used to cure tuberculosis of lungs, billiousness

and fevers. Berries contain four crystalline neutral substances. Further chemical and pharmacological investigations are indicated.

Madhuca indica J. F. Gmel. Syn.-*M. latifolia* Mcbrd. The Mahu tree. (Vern.-Mohua). I.P.C.

Grows in forests of Madhya Pradesh and is cultivated all over India. Also found in Uttar Pradesh, Bihar, Gujrat and Bombay. Its flowers, seeds and timber are of economic value. The seed-oil is edible and is also used for soap manufacture. The seeds contain 50 to 55% of a fatty oil and a saponin. Leaves contain a glucosidic saponin and traces of an alkaloid. Flowers contain sugar and enzymes. The plant is used as an astringent. It is largely employed as a lotion for chronic ulcers and bleeding spongy gums. Also considered beneficial in chronic bronchitis and chronic rheumatism. No proper clinical trials have been carried out.

Madhuca longifolia Linn. Macbd. (Vern.—Mohua) Syn.-*Bassia longifolia.* I.P.C.

Is found in forests of Western India, Kanara, Malabar and Mysore in the same way as of *Madhaca latifolia*. Seeds contain 40 per cent. of fatty oil and sapo-glucoside called 'Mowrin'. Fruit contains saccharose 4.6 to 16.2 per cent. and maltose 2.39 per cent., tannins and enzymes. Acts in the same way as *M. latifolia.* The sapo-glucoside acts on the heart in the same way as digitalis. Requires further investigation.

Mahonia nepalensis DC. Syn.-*Berberis nepalensis* Spreng. (Vern.—Chiror Anrudana, P.-Amudanda, Nep.-Chatri).

Grows in the outer Himalayas from Ravi eastward to Khasia and Naga Hills also in the Nilgiris at an altitude of 5,000 ft. It contains umbellatine.

Mallotus philippinensis Muell.-Arg. (Vern.—Kambila, S.-Rechanaka, H. & B.-Kamala, Bo.-Shendri, M.-Kapila). I.P.C.

Grows throughout the plains of India and Ceylon, tropical parts of Asia and Australia, Bombay and Bengal. It is used as anthelmintic especially against tape worms. Fruit contains a brownish-red resin called rottlerin, an impure rottlerin, traces of a volatile oil, starch, sugar, tannins and oxalic acid. It has toxic action on frogs, tadpoles and worms. The drug has a marked cathartic and anthelmintic action in doses of 2 to 3 drams.

Melia azedarach Linn. (Vern.—Drek).

Grows wild in Sub-Himalayan tract at altitudes of 2,000-3,000 ft. and is also cultivated. Root bark, fruit, flowers and leaves are considered hot, dry and to have deobstruent and resolvent properties. Juice of leaves used as anthelmintic, diuretic and emmenagogue. It contains a resin and the fruit a bitter substance. No systematic phamacological studies or clinical trials have been carried out.

Mentha arvensis Linn. (Vern.—H.-Podina, B. & Bo.-Pudinah. M.-Pudina) The marsh mint. B.P., B.P.C., I.P.C. & I.P.L.

Grows abundantly in northern and western Himalayas and in Kashmir at altitudes of 5,000 to 10,000 ft. It is used as a flavouring agent and as carminative and stimulant. Yields an oil similar to peppermint oil, to the extent of 0.18 to 0.2 per cent. The oil contains 4 to 14 per cent. esters as menthyl acetate and 46% of free menthol. Official in I.P.L.

Moringa oleifera Lam. Syn.-*M. pterygosperma* Gaertn. (Vern.—Sanjna, Saonjna). I.P.C.

The plant is found wild in the Sub-Himalayan tract from the Chenab to Oudh and is also cultivated throughout India. The root of this tree is extensively employed in intermetent fevers, epilepsy, hysteria, palsy, chronic rheumatism, dropsy etc. The root contains physiologically active bases and an antibiotic substance pterygospermin.

Myristica fragrans Houth. (Vern.—S.-Jatifalam, H., B. & Bo.-Jayphal, M.-Jadikkay). The nutmeg. B.P., B.P.C., I.P.L. & I.P.C.

Grows in the Nilgiri hills and on the Malabar coast. Oil is used in the manufacture of pharmacopoeial preparations and aperient pills to prevent griping. Nutmegs yield 5 to 15 per cent. of a volatile oil and 30 to 40 per cent. of fats; also phytostirin, starch, amylodextrin, colouring matter and a saponin. It is largely used for flavouring and as a carminative.

Myrsine africana Linn. (Vern. Gugul, H. Chapra).

Grows in Afghanistan, salt range and the Himalayas from Kashmir to Nepal at altitudes from 1,000 to 8,000 ft. Berries used as anthelmintic and as a remedy for skin diseases. They contain embellic acid 3 per cent. and quercitol 1 per cent. No pharmacological work or clinical trials have been carried out.

Oldenlandia auricularia Schum. Syn.-*Hedyotis auricularia* Linn. (Vern.-Gatta colla, B.-Muttia-lata).

Grows in Eastern Bengal and from Nepal, Sikkim and Khasia hills to Assam, Chittagong, Manipur and Burma. Also found in Kanara and Ceylon. Used in the treatment of dysentery and diarrhoea. Roots contain a fatty oil and glucosides, also reducing sugars, colouring matters, tannin, alkaloids auricularine, heydyotin and albumin. No pharmacological work has been done.

Papaver somniferum Linn. (Vern.—S.-Ahiphena, H. & B.-Afim, Bo.-Aphu, M.-Postakatol). The Opium. B.P., B.P.C., I.P.C. & I.P.L.

Cultivated in many parts of India especially in Utter Pradesh, Bihar and other parts of the world, China, Asia Minor, Turkey, Persia and Egypt. Dried inspissated juice obtained by incising the green fruit is opium which is used in the treatment of dysentery and diarrhoea as an anodyne sedative and euphoric. Opium contains about 25 alkaloids, the important ones being morphine, codeine, thebaine, papaverine and narcotine. In addition to these acetic, lactic, sulphuric and meconic acids, gummy and pectinous substances, albumin, wax, fat, resin, etc. also occur.

Opium is a soverign remedy for relieving pain and producing sleep. Opium and morphine are habit forming drugs and produce addiction.

Peganum harmala Linn. (Vern.—H. & Bo.-Hurmal, B.-Isband, M.-Shimai-azha-vanai-virai). I.P.C.

Grows wild all over N.W. India, Sind, Punjab and Kashmir, Agra and Western Deccan. Also found in Arabia, North Africa, Hungary and Spain. Seeds are used as alterative, aphrodisiac, lactagogue and anthelmintic. Contain alkaloids harmine, harmaline and harmalol to the extent of 4%. The alkaloids have some anthelmintic action and depress respiration and heart. Clinical trials revealed no effect in malaria. The seeds have been used to expel tape worms.

Peucedanum graveolens Benth. (Vern.—S.-Shatapuspi, B.-Soolpha, Bo.-Balunt-shep, M.-Satakuppi).

Grows in central and southern Europe and in tropical and subtropical countries. In India, it is cultivated as a cold weather crop. Used as a condiment, carminative, digestive and flavouring agent. Largely used in soap manufacture as a perfume. Yields 0.06 per cent. of an essential oil.

Picroena quassioides Benth. (Vern. Bharangi). I.P.C. & I.P.L.

Found in the outer Himalayas from Kashmir to Nepal and also in China. Bark and leaves used as febrifuge and insecticide. Contains bitter principles quassin and neo-quassin and a bitter alkaloid 0.05 per cent. Quassia is a popular bitter.

Picrorhiza kurrooa Benth. (Vern. —S.-Katuka, H. & B.-Katki, Bo.-Kalikutki, M.-Katuka-rogani). B.P.C., I.P.C. & I.P.L.

Grows in the North West Himalayas from Kashmir to Sikkim at altitudes of 5,000 to 11,000 ft. Used as a bitter tonic and stomachic. Contains 26.6 per cent. of a bitter substance and a glucoside. Can be used in medicine as a bitter if properly standardised.

Pimpinella anisum Linn. (Vern.—S.-Shetapuspa, H.-Saonf, B.-Muhuri, Bo.-Sonf, M.-Shombu). The Anise. B.P., B.P.C. & I.P.C.

Grows in Europe, Russia and Middle East and many other parts of the world. In India, found in Uttar Pradesh, the Punjab and Orissa. Used to prevent flatulence and intestinal colic and as an aromatic. It contains an essential oil which is used in medicine to prevent flatulence, intestinal colic and as a flavouring agent.

Pinus roxburghii Sargent. Syn.-*P. longifolia* Roxb. (Vern.-Chir, S.-Sarala) Chir Pine. B.P., I.P.C. & I.P.L.

Grows in abundance in U.S.A. and France. In India, it is found in the temperate Himalayas from Kashmir to Burma at altitude from 2,000 ft. to 6,000 ft. The oil is used in the manufacture of paints and varnishes and colophony for plasters in medicine. The oleoresin yields about 20 per cent. of turpentine oil and about 80 per cent. of residue named as colphony which is used in medicine for preparation of plasters and ointments. Oil of turpentine is used externally as a counter-irritant

and rubefacient. Small doses of oil are given internally in bronchitis and larger doses as an anthelmintic.

Piper betle Linn. Betel leaf. (Vern.-S.-tambula, H., B. & Bo.-Pan, M.-Vettilai). I.P.C.

It is cultivated in Madras, Central Provinces, Bengal, Orissa, Bombay, U. P. and Burma. Leaves are used as an aromatic, stimulant, carminative, astringent and aphrodasiac Contain an essential oil, starch, sugar, tannins and diastases. No pharmacological studies have been carried out. Leaves with other substances such as betel nut, lime, catechu, etc. are widely chewed in India. They act as mental stimulant and digestive.

Piper cubeba (Vern.—S.-Sugandha muricha, H., B. & Bo.-Kababchini, M.-Val milaku). Cubebs. I.P.C. & B.P.C.

Found in Java, Sumatra and Malaya Archipelago and cultivated to a small extent in India in Mysore. Fruit is used as a condiment and in the treatment of genito-urinary diseases, cystits, gonorrhoea and gleet. Contains an essential oil upto 10.15 per cent.

Pistacia integerrima Stew. (Vern.—Kakra, S.-Karkata sringi, H. & B.-Kakra shingi, M.-Kakkata shingi). I.P.C.

Is found in the sub-alpine Himalayas. It is used as a remedy for cough, phthisis and asthma in doses of 20 grs. combined with aromatics. Galls contain an essential oil 1.21 per cent. a crystalline hydrocarbon 3.4 per cent. tannins and gum mastic 5.0 per cent. No systematic investigations have been carried out. Further clinical trials are needed.

Plantago ovata Forsk. Ispaghula. (Vern.—H.-Ispaghul, B.-Isabgul, Bo.-Isabghol, M.-Ishappukol-virai). B.P.C., I.P.C. & I.P.L.

Grows in the plains of the Punjab and Sind and low hills from Sutlej westwards. It is also cultivated in Bengal, Mysore and Coromandel Coast. Seeds are cooling and demulcent and are used in dysenteries, diarrhoea and other inflammatory conditions of digestive and urinery tract. Contain a fatty oil, albuminous matter and mucilage. Some species contain a glucoside named aucubin, which is pharmacologically inactive. The mucilage from seeds inhibits growth of common intestinal organisms in the gut. The colloidal nature of the mucilage has a remarkable power of adsorbing bacteria and toxins and is soothing. The seeds are prescribed in chronic bacillary and amoebic dysentery, chronic constipation and chronic diarrhoea in doses of 1—2 ounces soaked in water. The pericarp of seeds separated is more convenient for use and is taken in doses of 2 to 3 teaspoonsful once or twice daily.

Plumbago indica Linn. Syn.-*P. rosea* Linn. (Vern.-S.-Chitraka, H., B. & Bo.-Lal chitra).

Commonly cultivated in gardens of India. Root is used as abortifacient and vesicant in rheumatic affections of joint and paralytic conditions. Contains, plumbagin, the active principle, amorphous brown pigment and a reducing sugar. No systematic pharmacological investigations have been carried out.

Plumbago zeylanica Linn. (Vern.—S.-Chitraka, H. & B.-Chita, Bo.-Chitaro, M.-Chittira)

Grows throughout India, particularly in Uttar Pradesh, Bengal and Southern India. Root is used in digestive disorders, piles, anasarca and skin diseases and as abortifacient. It contains an active principle named as plumbagin, which stimulates the central nervous system, heart and plain muscles in small doses. Larger doses have a depressant action. Systematic clinical trials are needed to establish its therapeutic value.

Podophyllum hexandrum Royle. (Vern.—H.-Papra). B.P., B.P.C., & I.P.C.

Grows in the temperate forests of the Himalayas from Sikkim to Kashmir at a height of 7,000 ft. Used as a drastic purgative and as a cholagogue. Contains a resin 8 to 13 per cent., flavonol, quercetin, starch and calcium oxalate. Podophyllum is irritant to the eyes and mucuous membrane. It is an active purgative and is administered in average doses of 0.01 gm.

P. paltatum contains podophylotoxin and α & β paltatins, the farmer has been shown to be present in *P. hexauclum*, but not paltatins. The resin is effective in destroying soft warts or condylomata.

Pongamia pinnata Merr. Syn.-*P. glabra* Vent. (Vern.—Kanga, S., H. & Bo.-Karanja, B.-Dahar karanja).

Grows all over India especially near the Coast, from Central and Eastern Himalayas to Ceylon. The seeds and leaves are used in treatment of skin diseases and rheumatism. Internally the seed oil is used as stomachic, cholagogue, febrifuge and expectorant. It is bitter fatty oil forming 27 to 36.4 per cent. of seeds containing traces of an essential oil. It also contains two crystalline compounds named as karanjin and pangamol. No systematic pharmacological investigations or clinical trials have been carried out.

Premna integrifolia Linn. (Vern.—S.-Ganikarika, H. & Bo.- Arni, B.-Ganiari, M.-Munni-vayz).

Grows near the sea from Bombay to Malacca and in Ceylon. Root is used as laxative, carminative and stomachic. The decoction of whole plant is used in the treatment of fevers and rheumatism and neuralgia. Stem bark contains three alkaloids, premine, ganiarine, ganikarine and some unsaturated aromatic hydrocarbons. The alkaloids ganiarine and premnine have a sympathomimetic action. Further work is indicated.

Pristimera indica Willd. Syn.-*Hippocratea indica* Willd.

Grows wild in forests from Konkan to Madras in South Bengal and Assam. Paste from roots used as a remedy for respiratory troubles. Root contains dulcitol and an antibiotic pristimerin which is effective against gram positive organisms. Preliminary clinical trials revealed that pristi merin is effective against throat affections. Further investigations are in progress.

Psoralea corylifolia Linn. (Vern.—S.-Vakuchi, H. & B.-Babachi, Bo.-Bobawachi, M.-Karpo-Karishi). I.P.C. & I.P.L.

Grows all over the plains of India. The seeds are considered anthelmintic, diuretic, diaphoretic and a remedy against skin diseases and leprosy. They contain an essential oil a fixed oil, a resin and traces of an alkaloidal substance. The oil has an irritant action on skin. It is

toxic to paramoecia and bacteria. Plain muscle is stimulated and areterioles are dilated. An oleoresinous extract made from seeds has beneficial effect in leucoderma when applied locally. Seeds are also taken internally in this affection.

Randia dumetorum Lamk. (Vern.—S.-Madan, H.-Maniphal, B.-Menphal, Bo.-Gelaphal, Maruk-kallan-kai).

Grows throughout India. Fruit is used as an emetic and aperient and as a substitute for ipecacuanha. Contains a small quantity of an alkaloidal substance, Randia saponin and a glucoside. Randia tannic acid and Randia fat are also present. The drug produces irritation of the mucous membrane and haemolysis both in vitro and in vivo. Frog's heart is arrested when perfused with drug solution in concentration of 1 in 50,000. No clinical trials have been carried out.

Rauwolfia canescens Linn.

Grows wild in Howrah district near Calcutta in Bengal. Roots used to adulterate those of *R. serpentina*. Root bark stem bark, and leaves contain an alkaloidal body named as rauwolscine. The alkaloid is depressant to the cardio-vascular system. It is also sympatholytic in action and abolishes the pressor effects of adrenaline. Further work is in progress.

Rauwolfia serpentina Benth. (Vern.—S.-Sarpagandha, H.-Chota cl.and, B. & Bo.-Chandra, M.-Covannamilpori). B.P.C., I.P.C. & I.P.L.

Grows near the foot of hills from Moradabad to Sikkim, in Assam, Pegu, in Southern India along the Ghats ; also occurs in Java and Malaya. Root is used as an antidote in snake bites and as a remedy for insomnia, hypochondria and insanity. It contains alkaloids, ajmaline, ajmalinine, serpentine and serpentinine. Extracts containing the total alkaloids, including serpentine, lower blood pressure in animals ; ajmaline and serpentinine raise it. Recently a new alkaloid, Reserpine, has been isolated which has a marked sedative & hypotensive action. Doses of 20 to 30 grains of powdered root produce sedative effect and lowers blood pressure especially the diastolic. Considerable work is being carried out on this drug in Europe and America on account of blood pressure lowering properties and sedative effects.

Rheum emodi Wall. (Vern.—H. & B.-Revandchini, Bo.-Iadakirevanda chini, M.-Nattu-ireval-chinni). Indian Rubarb. I.P.C. & I.P.L.

Grows wild in the Himalayas in Nepal and Sikkim at altitudes of 4,000 to 12,000 ft. Used in ailments of children and as a purgative. Contains derivatives of anthraquinone to the extent of 2.0 to 4.5 per cent gallic acid, tannin, starch, fat, dextrose and levalose, pectin and calcium oxalate.

Ricinus communis Linn. (Vern.—S.-Eranda, H.-Arand, B.-Verenda, Bo.-Erendi, M.-Amanakham chedi). Castor seeds. B.P., B.P.C. & I.P.C.

Cultivated throughout India particularly in Madras, Bombay and Bengal. Seeds contain a fixed oil which consists of ricinoleate of glycerol with a small quantity of palmitin and stearin and a toxic substance ricin. Oil from seeds is used as a purgative.

Rosa damascena Mill. (Vern. – H.- Gulab ka phul, S.- Satapatri, B.- Golapphul, Bo.-Gul, M.-Golappu). The Rose. B.P. & B.P.C.

Chiefly cultivated in Bulgaria. In India it is cultivated in the Punjab, United Provinces, Bihar and Orissa. Rose water is used for eye lotions and the oil as a flavouring agent. Flowers contain a pleasant smelling essential oil used as perfume, and fruits contain Vit. C.

Santalum album Linn. (Vern.—S.-Swet-chandan, H.-Safedchandan, B.-Sadachandan, S.-Mhandanak-kattai). B.P., B. P. C. & I. P. C.

Grows wild and is cultivated in Mysore State, Coorg, Coimbatore and Southern parts of Mysore. Wood is used as bitter, cooling, astringent and useful in biliousness, fever and thirst. Paste made from wood as a cooling application for skin affections. The heart wood of the tree yields an essential oil 2.5 to 6 per cent. which is used for flavouring purposes and as urinary disinfectant.

Saraca indica Linn. (The Asoka tree) Vern.—S.-Asoka, H., B. & B.-Asok, M.-Asek). I.P.C.

Grows in Bengal, South India, Arakan, Tenasserim and is also cultivated in many parts. Bark is used as astringent, uterine sedative in menorrhagia and as a remedy for piles and dysentery. It contains tannins and catechol. Various fractions isolated from the bark produced no marked action on uterus but faith in its beneficial effects in uterine disorders persists.

Saussurea lappa Clarke Comp. The Costus (Vern.– S.-Kushtha, H.-Kut, B.-Pachak, Bo.-Ouplate, M.-Goshtam). I.P.C. & I.P.L.

Grows in N.W. Himalayas especially on the slopes of mountains round the Kashmir valley upto an altitude of 13,000 ft. Root is used as hairwash to kill lice and as insect repellent, carminative, stimulant and antiseptic. Root contains an essential oil, 1.5 per cent., an alkaloid named as sausserine, resin 6.0 per cent., traces of a bitter substance, tannin, inulin 18 per cent, a fixed oil and potassium nitrate. Leaves contain only the alkaloid. The essential oil has strong antiseptic and disinfectant properties. The circulatory system is stimulated and smooth muscle of bronchi and intestines is relaxed. The alkaloid produces relaxation of bronchioles and has a general depressant action in involuntary muscles. The heart is stimulated. An alcoholic extract of root in 1/2 to 2 dram doses relieves asthmatic attacks.

Scilla indica Baker (Vern.—H. & B.-Suphadie-khus, Bo.-Bhui-kanda, M.-Shirunari-vengayam).

Grows frequently in sandy places near the sea in the Deccan Peninsula from the Concan and Nagpur southwards. Used as expectorant, cardiac stimulant and diuretic. Squill contains a number of cardiac glycosides. Clinical trials have revealed that it has beneficial effect on patients suffering from bronchial catarrh and chronic bronchitis.

Semecarpus anacardium Linn. The marking nut tree (Vern.—S.-Bhallatamu, H. & B.-Bhela, Bo.-Biba, M.-Shayrang).

Grows in Sub-Himalayan tract from Sutlej eastwards down to Assam at an altitude of 3,500 ft. Juice is used in preparation of a varnish, fruit is used as a substitute for marking, counter irritant in rheumatism, sprains

and leprotic nodules. Internally juice is used in syphilis, scrofulous affections, piles and nervous debility. The pericarp of the fruit contains 20 per cent. of an oil, which gives bhilawanol and other compounds. No systematic investigations have been carried out to determine its beneficial effects in treatment of disease.

Sida cordifolia Linn. (Vern.—Khareti, S.-Bala, H.-Kungyi, B.-Brela, Bo.-Chikana, M.-Chiribenda). I.P.C.

Grows throughout tropical and sub-tropical India and Ceylon. Root is used as cooling, stomachic, tonic, febrifuge and diuretic. The seeds are considered aphrodisiac and are also used in the treatment of cystitis, rheumatism and spermatorrhoea. The seeds contain fatty oil, and an alkaloid (0.085 per cent.) recognised as ephedrine, which probably is responsible for its cardiac stimulant effects.

Skimmia laureola Sich. & Zucc. (Vern.-Bassu, Nep.-Chumlani, P.-Ner).

Grows throughout temperate Himalayas from Kashmir to Khasia hills. The leaves are used as an incense and burnt near smallpox patients. Leaves contain an essential oil with pleasant smell and an alkaloidal substance. No systematic pharmacological studies have been carried out. The essential oil could be used as perfume in soap and cosmetic industry.

Sonneratia acida Linn. (Vern.-B.-Archaka).

Grows in Bengal and the Deccan Peninsula. Used as a poultice in sprains and swellings. Juice is used for stopping haemorrhage. Contains colouring matter, archin and archinin and a crystalline compound archicine. No pharmacological studies have been carried out.

Stephania glabra Roxb. Miers (Vern.-Pusha).

Grows in tropical and temperate Himalayas ascending to an altitude of 7,000 ft. from Sindh eastwards to Khasia hills and Pegu. Root is used as a remedy against phthisis, asthma, dysentery, fevers and intestinal complaints. Tubers contain three alkaloids, gindarine, gindaricine and gindarinine. No pharmacological and clinical studies have been carried out.

Strychnos nux-vomica Linn. (Vern.—S.-Visha-mushti, H.-Kuchla, B.-Kuchila, Bo.-Kajra, M.-Yetti). B.P., B.P.C., I.P.C. & I.P.L.

Grows wild throughout tropical India upto an altitude of 4,000 ft. in Orissa, Madras, Cochin, Travancore and the Coromandal Coast. Seeds are used in the treatment of dyspepsia and diseases of the nervous system. Fruit, bark, leaves and wood contain strychnine, brucine, vomicine, etc. Seeds contain 1.53 to 3.42 per cent. of the total alkaloids of which half is strychnine.

Swertia chirata Ham. (Vern.—S.-Kirata, H.-Charayatah, B.-Chireta, Bo.-Chiraita, M.-Nila-Vembu) Chiretta. B.P.C., I.P.C. & I.P.L.

Grows abundantly in the temperate Himalayas from Kashmir to Bhutan and Khasia Range between altitudes of 4,000 to 10,000 ft. Used as a bitter tonic, stomachic febrifuge and anthelmintic. Contains a bitter glucoside chiratin, resins, tannin and ash 4 to 8%.

Symplocos racemosa Roxb. (The Lodh tree) Vern.—S -Lodhra, H. B. & Bo.-Lodh, M.-Ludduga). I.P.C.

Grows in plains and lower hills of Bengal, Assam and Burma. It is also found in dry forests of Chhota Nagpur plateau. Bark and leaves are used for dyeing purposes. The bark is used as astringent in bowel complaints, eye diseases and ulcers. Bark contains three alkaloids, loturine 0.24 per cent. collutrine 0.02 per cent. and loturdine 0.06 per cent. No systematic pharmacological investigations or clinical trials have been carried out.

Terminalia arjuna W. and A. (Vern.—S. & Bo -Arjuna, H. & B.-Arjun, M.-Vellai-maruda-maram). I.P.C.

Grows throughout the Sub-Himalayan tracts of United Provinces and in the Deccan, Southern Bihar, Chhota Nagpur, Burma and Ceylon. Bark is used as a cardiac tonic in heart diseases and contains large quantities of calcium salts, about 12 per cent. tannins, an organic acid, an ester and some colouring matters and sugar. It is reputed to have a stimulant action on heart. Clinical trials however showed no beneficial effects in heart disease. Further investigations needed.

Thalictrum foliolosum D.C. (Vern.—H.-Pinjari, P.-Gurbiani, Bo.-Mamiran).

Grows in Khasia hills between altitudes of 4,000 ft. to 6,000 ft. It is used as a bitter tonic and laxative. It is a cheap but valuable substitute of Mamira used in preparation of eye solves. It contains two alkaloids berberine and thalictrine. No proper investigations have been carried to study its efficacy in conjunctive affections.

Thevetia peruviana Schum. Syn.-*T. neriifolia* Steud. See poisonous plants of India. (Vern.-H. & Bo.-Pila-kaner, B.-Kolka-phul. M.-Pachch-ai-alari).

Grows in plains all over India, but originally a native of west Indies. Seeds are used as abortifacient and as poison for man and cattle. They contain 57 per cent. of a colourless oil, which yields glucoside thevetin which is not toxic to unicellular organisms. The drug is toxic to higher animals and is not likely to be of therapeutic value because of powerful toxic effect on heart muscle.

Tinospora cordifolia Miers. (Vern.— Giloe, S.-Guduchi, H. & B.-Gulancha, Bo.-Gulwail, Bo.-Gulwail, M.-Sindilkodi). I.P.C. & I.P.L.

Grows in Uttar Pradesh. It is used in treatment of rheumatism hyperacidity and dyspepsia and as a tonic, antiperiodic and diuretic. Stems contain glucoside giloin and non-glycosidic bitter, gilenin and gilosterol. No Pharmacological investigations or clinical trials have been carried out.

Toddalia asiatica Lam. Syn.-*T. aculeata* Pers. (Vern.—S -Kanchana, H.-Kanj, B.-Koda-todali, Bo.-Jun-li-kali-mirchi, M.-Milkaranai)

Grows in the Nilgiris and sub-tropical Himalayas from Kumaon to Bhutan upto an altitude of 3,000 ft. Root bark is considered to be antimalarial. The plant contains two alkaloids, todaline and todalinine. Leaves contain an essential oil and root bark contains an essential oil,

resin, bitter substance, citric acid, pectin and starch. A freshly prepared infusion of the plant is very feebly toxic. The alkaloid todaline has no antipyretic action. The root bark has no antimalarial properties.

Trachyspermum ammi (Linn.) Sprague, Syn.-*Carum copticum* Benth. (Vern.-S.-Yamani, H. & Bo.-Ajowan, B.-Jowan, M.-Oman) B.P. & I.P.C.

Widely cultivated all over India. Seeds are used in diarrhoea, dyspepsia, cholera, colic, flatulence and indigestion and as tonic. They contain thymol.

Tribulus terrestris Linn. (Vern.—Gokhru, S.-Gokshura, H.-Chota-gokhru, B.-Gokhuri, Bo.-Lahana-gokhru, M.-Nirunji). Small Caltrops. I.P.C.

Grows throughout India and Ceylon. Fruit is used as diuretic, tonic, aphrodisiac and in the treatment of urinary disorders and impotency. The fruit contains an alkaloid in traces, a fixed oil, an essential oil, resins and nitrates. Preliminary investigations revealed that the alkaloid produces slight rise of blood pressure and appreciable rise in kidney volume. Clinical trials confirm its diuretic action. Further investigations are needed.

Tylophora indica Merr. Syn.-*T. asthmatica* W. & A. (Vern.—H. & B.-Antamul, Bo.-Anthalmul, M.-Nay-palai). I.P.C.

Grows in North and East Bengal, Assam, Kachar, Chittagong and the Deccan Peninsula upto a height of 3,000 ft. Root and leaves have been used as a substitute for Ipecacuanha in dysentery catarrh and other affections. Root contains two alkaloids tylophorine and tylophonine The drug produces dermatitis on contact. The alkaloid is toxic to protozoa and has a depressent action on the heart. No clinical trials have been carried out. Deserves further study.

Urginea indica Kunth. (Vern.—S.-Vana—palandam, H. & B.-Jangli piyaz, Bo.-Jangali-kanda, M.-Nari-vengayam) B.P.C. & I.P.C.

Grows in the Western Himalayas upto 7,000 ft., shores of Coromandal, Konkon and Western Ghats. Contains glycosides scillaren-A and scillaren-B, musilage, carbohydrates, a phytosterol and calcium oxalate. Used as cardiac stimulant and expectorant.

Valariana wallichii D. C. (Vern.—S.-Tagara, H. & B.-Tagar, Bo.-Tagar-ganthoda). B.P.C. & I.P.C.

Grows in the temperate Himalayas from Kashmir to Bhutan at altitudes ranging from 4,000 to 12,000 ft. Used in the treatment of hysteria and nervous troubles of women. Contains 0.3 to 1.0 per cent of volatile oil containing esters of iso-valerianic acid and formic acid.

Vanda roxburghii R. Br. (Vern.—S., H., B. & Bo.-Rasna, M.-Knapa-chettu).

Grows in Bengal, Chota Nagpur, Madhya Pradesh, Cochin and Travancore. Roots considered beneficial in rheumatism, diseases of nervous system and in secondary syphilis. It contains a glycoside tannin, saponins, sterols, fatty oil and resins. The glycoside, has low toxicity and stimulates all organs having cholingeric nerve supply. The heart is slowed and cardiac output is diminished. No clinical trials have been carried out.

Vitex peduncularis Wall. (Vern.—H.-Nagbail, B.-Goda, M.-Navaladi). I.P.C.

Grows in Bihar, Eastern Bengal and Madhya Pradesh. The leaves and roots are used in the treatment of malarial and black water fevers. Leaves contain a glycoside. Clinical trials with infusion of leaves showed no beneficial effect in malaria or black water fever.

Withania somnifera Dunal. (Vern.—S., B. & Bo.-Ashwagandha, H.-Asgandh, M.-Amku lang-kalang). I.P.C.

Grows throughout the drier parts of India, Baluchistan and Ceylon. Leaves and roots are used in the treatment of tumours tuberculus glands, bronchitis, rheumatism and dyspepsia. The plant contains pot. nitrate, tannin, colouring matter, glucose and an alkaloid. It has a mild sedative effect on animals. Deserves further study.

Xanthium strumarium Linn. (Vern.—S.-Aristha, H.-Chhota-gokru, B.-Bon-okra, Bo.-Shankeshvara, M.-Marlu-mutta). I.P.C.

Grows throughout the hotter parts of India upto an altitude of 7,000 ft. The whole plant is used as diaphoretic and sedative. Root is used as bitter tonic and in the treatment of cancer and strumous diseases. It contains fat 38.6 per cent., albuminoids 36.6 per cent. and a glycoside Xanthostrumanin 1.3 per cent. The glucoside is physiologically inactive. No clinical trials have been carried out.

Zingiber officinale Rosc. (Vern.—S.-Adrakam, H.-Adrak, B.-Ada, M.-Inji). B.P. & I.P.C.

Cultivated in Cochin, Bengal, Bombay, Kumaon and many other parts of India. Used as a condiment in food and as carminative and stimulant of the gastro-intestinal tract. Contains 0.25 per cent. of a volatile oil of light yellow colour, resinous matter, starch and mucilage.

CHAPTER VII

I. TOXICOLOGICAL ASPECTS OF INDIAN PLANTS

The second line of basic research has been in connection with the Poisonous Plants of India including the group of insecticides, insect repellent etc. Here we will briefly refer to the present position with regard to the toxicological aspects of Indian Plants.

(1) CRYPTOGAMS OR THE FLOWERLESS PLANTS.

The toxicological aspects of the Cryptogams are little known so far as India is concerned.

(a) **Bacteria**. The bacteria are among the simplest form of plant life and are met with universally. The majority of them are harmless, but some are injurious to man and animals. They produce deleterious effects in two ways:—Firstly as parasites, when they derive nourishment from living animals and many of them produce, within the body, toxins which are harmful. Secondly many saprophytic bacteria produce poisonous substances, especially such as those occuring in putrid flesh, fish and other decaying organic matter. It is not our intention to give details of toxic properties of this group. These are fully discussed in books on bacteriology. Bacteria are a class by themselves and although they belong to vegetable kingdom do not come under our purview here.

On the other hand a number of organisms of this group produce antibiotic substances which are of very great value in the treatment of disease. Streptomycin has been derived from *Streptomyces griseus* (*Actinomyces griseus*), Aureomycin from *Streptomyces auriofaciens*, Terramycin from *Streptomyces rimosus*, Chloromycetin from *Streptomyces veneznelae*, Bacitracin from strains of *B. subtilis*, etc.

A large amount of work is now being done in this country on the isolation of antibiotic substances from various soil and other micro organisms found in this country.

(b) **Algae**. The algæ that cause poisoning are mostly those which are found in stagnant waters. The normally offensive odour may be sufficient to indicate their presence, but only a microscopic examination can determine just what the forms of algæ present may be. Blue-green algæ, as a group, are perhaps the most pronounced in their toxic effect. Parker and other workers have shown that when odours in water are pronounced, these microscopic organisms are present in considerable numbers. He claims that of the organisms which produce objectionable and deleterious qualities in water, the microscopic ones are the more important and very few cases have been observed in which really serious trouble in water supplies could be attributed directly to the growth of larger plants. In any study of the algæ from this point of view, however, account must be taken of the products of decomposition by the associated bacteria, since poisoning may be produced by the toxins produced by bacteria rather than by the algæ.

Certain algæ, such as *Microcystis flos-aquae* (Wittr.) Kirch, *Aphanizomenon flos-aquae* (Linn.) Ralfs. and species of Anabœna, etc. form on the surface of water what is generally called water bloom. The presence of water bloom on the surface of lakes, ponds, and other open sheets of water is distasteful to bathers and obnoxious to those living in the vicinity. Livestock compelled to drink water containing water bloom are reported to have suffered from poisoning. In Minnesotta, (U.S.A.) during recent years, horses, cattle, sheep and donkeys have died in large numbers on the shores of lakes where water bloom is present. All the above mentioned algæ forming water bloom have been recorded in various parts of India but no work has been done in connection with their toxic effects. According to Dr. Bhardawaja of the Benaras Hindu University, water blooms containing these species occur commonly on the surface of many temple tanks in different parts of India. Of the other possibly harmful algæ may be mentioned species of *Nodularia, Clathrocystis, Nostoc, Oscillatoria, Pandorina,* and *Volvox* when present in large numbers.

The question of growth of algæ in water reservoirs leads us to a very important public health problem. Although in India very little information is available about the contamination of the water supplies with the group of toxic algæ, the important question of checking their growth in the reservoirs of water supplies needs study. One of the essentials of the algal growth is light. This growth may, therefore, be prevented, or at any rate considerably reduced, by covering up the reservoirs and cutting off sunlight. Most of the reservoirs for the supply of water to both animals and man, however, in India are generally not covered and are often largely contaminated with algal growth. The removal of organic matter by keeping the source of water supply in as pure a state as possible will not doubt keep down the algal growth. It must be understood, however, that nearly all water contains sufficient organic matter for the growth of algæ, especially the water coming from water-sheds. Growth of algæ can also be successfully prevented by additions of copper sulphate in dilutions of one in five millions or even more. Such dilutions do not render the water deleterious to man and animals. The problem of toxic algæ is important and deserves the attention of workers in this field. It is also possible that some of these algæ may contain active principles having therapeutic properties in the treatment of disease. This aspect has yet to be investigated.

(c) **Fungi.** (i). Some fungi live on the skin and mucous membranes of man and animals and cause various, diseases, e.g. ringworm, thrush, etc.

(ii). There are others which attack foodstuffs and among these may be mentioned :—

(1) **Smuts.** Many of these are destructive parasites which invade plants of vital economic importance on account of their food value, such as oats, millet and other cereals. Some are supposed to be piosonous if taken in large quantities, and others are said to produce irritation of the mucous membranes. There is difference of opinion with regard to the injurious effects produced by particular kinds of smut and hardly any authentic information is available regarding those occuring in India. The subject deserves the attention of mycologists.

(2) **Rusts.** Annual reccurrence of the outbreaks of rust attacks of cereals in India, especially those attacking wheat, is of great economic importance to the country. These, especially the uredo stage, produce

inflammation of the mucous membrane of the mouth and nose. The dust coming from the infested straw when the grain is thrashed is stated to cause serious disturbances of the respiratory tract of man and animals. Very little information is available about the Indian strains.

(3) **Ergot**, which grows on rye, is a well known example of a fungus which produces highly poisonous substances. Some species of this fungus grow on wild grasses in India and Ergot itself has been grown in this country for medicinal purposes.

(4) The poisonous nature of the seeds of darnel (*Lolium temulentum* Linn.), a grass and annual weed cultivated especially in northern India, is believed to be due to a fungus, and cases of poisoning due to admixture of the seeds with wheat grains are not infrequently reported in India and abroad. Cases of death among livestock have also been reported.

(5) **Moulds**. Very variable data are available as regards the poisonous effects of mouldy food stuffs in India, but there appears to be little doubt that the presence of certain species may occasionally produce harmful effects in man and animals. Species of *Mucor*, *Aspergillus*, *Penicillium* and *Fusarium*, etc. deserve special investigation in this connection. It appears, however, that there is an appreciable difference in the susceptibility of different species of animals to the effects of mouldy foodstuffs. In general it has been stated that horses, dogs and pigs are more susceptible than ruminants and poultry, while in other animals the case may be the reverse. Very little information is available about the toxicity of moulds occurring in India and the problem requires a thorough investigation because of its great economic importance. In the meantime it would be safer to consider all fungus-infected food-stuffs as deleterious. Acute poisoning with the moulds is rarely met with and if they are taken in small quantities there is hardly any danger. Mouldy food should however be avoided. It is worthy of note that some of these fungi are the source of powerful antibiotic substances such as penicillin from *Penicillium notatum*, fumigaen from *Aspergillus fumigattus*, calvicin from *Aspergillus clavatus*, etc. A large amount of work is now being done in this country in connection with antibiotics from local strains of these organisms.

(iii) **Mushrooms or fleshy fungi**. The third group of the poisonous fungi belongs to the mushroom class. A number of these are edible and many occurring in India are indiscriminately eaten by people and if properly cooked few produce serious toxic effects. Cases of fungus poisoning, however, are not infrequently met with, particularly in the hills. Unfortunately very little information is available about the poisonous fungi growing in this country and inspite of numerous cases of poisoning, little attention has been paid to the subject.

Stropharia semiglobata (Batsch) Quel. from Khasia hills, *Hypholoma fasiulare* (Huds.) Fr. from Darjeeling and Simla and *Lactarius vellereus* Fr. from Sikkim are regarded as poisonous. There is also evidence on record that there exists in Bengal a fungus which closely resembles an edible variety but which contains amanitine or muscarine, the poisonous principle of the foreign *Amanita muscaria* Pers. There are probably many more poisonous species that have really been incriminated as poisonous, but on the whole their number may be small and indeed if properly cooked

only a few are dangerous. If washed in water and macerated in vinegar before cooking, and if eaten with plenty of bread there is almost no danger in most cases. The safest method, however is to learn to recognize the edible species and never to eat a fungus until its identity is certain.

Some of the foreign poisonous fungi, e.g. *Lepiota cristata* Quel. *Volvaria gloicephala* Gill., *Amanita muscaria* Pers. and *Amanita phalloides* Secr. are well known. The last-mentioned is responsible for perhaps 90 per cent. of the deaths caused by fungus poisoning in Europe, Great Britain and U.S.A. During the World Wars, when food scarcity became acute in Germany and Austria, poisoning from fungi appreciably increased.

According to Ford there are four main types of mushroom intoxication :—(1) Gastro-intestinal type in which the attack ceases when the stomach is emptied. (2) General catharsis which is painless. (3) Violent vomiting and pain but no involvement outside the gastro-intestinal tract. (4) Choleriform type producing widespread degeneration of cells. With regard to edible fungi it may be stated here that the nutrition value of mushrooms is small, their chief value being their flavour and the feeling of satiation they produce. The following is a list of mushrooms met with in India :—

Agaricus compestris Linn.—The Mushroom; (Sans.—Chattrak; Kash.—Manskhel; Beng.-Banger chhata; Sant.—Ot : Bomb.—Alombe). Generally in damp debris throughout India during rainy season; universally eaten fresh or dried.

Amito pers. Kurrum.

A. ostreatus Jacq. (Cutch & Bomb.—Phanasa-alambe, or vulgarly phansamba). Grows upon stumps of old jack-trees (phanas).

Cantharellus cibarius Fr. Kashmir, Peshawar, Mussoorie.

Collybia albuminosa (Berk) Betch. (Syn.-Lepiota albuminosa Berk). (Beng.—Durga chhata). Bengal, C.P., and Berar. Grows from inside the termites, nests; eaten with relish.

Coprinus comatus (Battara) Fr. The Mushroom; Hindi. & Punj.-Khumbi, Khumb) Punjab, Uttar Pradesh and several other parts of India. Eaten fresh or dried. Collected during rainy season.

Entoloma microcarpum Berk & Broome. (Beng.-Wee-chhata). Bengal. Grows on the surface of outer crust of termites' nests; commonly eaten by villagers.

Fistulina hepatica Fr. Darjeeling.

Helvella crispa Fr. Common in Afghanistan.

Hirneola polytricha Mont. (Syn.-*Exidea polytricha* Mont.). Belgium, Poona, Dharwar, Nidungayam, Malabar and Burma.

Hydnum caralloides Scop. Darjeeling 7,500 ft., Chitral, N.W.F.P. (common) and Afghanistan. In crevices of old tree-trunks collected during August; dried in the sun and largely used.

H. repandum Linn. Mussoorie, Uttar Pradesh.

Lactarius deliciosus Fr. Sikkim.

Lentinus subnudus Berk. Common in Bengal, Kadala and Bombay. On dead branches of logs. Eaten by Kholes fresh and young.

Lepiota mastoidea Fr. Bengal.

L. procera (Scop) Sacc. Saharanpur.

Lycoperdon sp. Puff-balls. Bengal, Kashmir and many parts of Western Himalayas.

Malanogaster durissiums Cooke. Truffle. Simla (abundant), Kangra. Occasionally eaten.

Morchella esculenta Pers. The Morell; (Punj.-Guchhian) Plains, kana kach hills. Fleshy fungus abundant in Kashmir, Chamba and many parts of Northern Punjab. It appears on hills as snow melts in early spring. It is dried and is eaten with much relish.

Pleurotus cretaceus Massee. (Vern.-Dhingri). Peshawar and Madhya Pradesh. On wood.

P. fimbriatus Bolt. C. P. and Berar.

Polyporus squamosus (Huds) Fr. Darjeeling, 7,500 ft.; Pangi, N.W. Himalayas. On dead wood.

Truffles. Stewart describes some being found in Kashmir. Badhwar has recently collected some blackish-brown ones from the Kagan valley locally known as 'usri'. They are highly flavoured and their presence in the soil is discovered by the villagers by smell in September-October when they are said to develop the flavour best. Goats are also said to dig out some during grazing and eat them. (Also see *Melanogaster durissiums* above).

Volvaria diplasia Berk & Broome. (Beng.-Pawal-chhatta). Bengal, Burma.

V. terrestria Berk & Broome. (Beng. - Poal-chhattea). Bengal. Grows on heaps of waste paddy straw.

In addition Stewart mentions another species as being freely eaten in the Punjab, which is known as 'shirian' in the Jhelum and 'batbakri' in the Kair valley. It is a thin, flat ragged-looking fungus, yellow above and with white gills below, which is found on dead trees in various parts of the Punjab Himalayas at altitudes of 8,000 to 8,500 ft. He also mentions an 'underground mushroom' of doubtful species found near Multan called 'boinphal'.

So far as the Poisonous Mushrooms are concerned little information is available. The following is a list of mushrooms which are known to be poisonous :-

POISONOUS FUNGI

Very little information is available regarding the Indian poisonous fungi. From time to time cases of fungus poisoning are reported but. it is to be regretted that little or no attention has been paid to the subject

Stropharia semiglobata (Batsch) Quel. from Khasia Hills.

Hypholoma fasciculare (Huds). Fr. from Darjeeling and Simla and *Lactarius vellerens* Fr. from Sikkim, are regarded as poisonous. There is also evidence on record that there exists in Bengal a fungus which closely resembles an edible form but which contains amanitine or muscarine, the poisonous principle of *Amanita muscaria* by eating which, symptoms closely resembling those of intoxication rapidly ensure. Furthermore, mucor has been regarded as a harmful in India since ages, and the pickles and all edible stuff attacked by it are not thought fit for eating.

There are, however, some foreign fungi which are definitely reported to be poisonous.

Amanita phalloides. The death cap is responsible for perhaps 90 per cent of the deaths caused by fungus poisoning in Europe, England and U. S. A. It is the most dangerous fungus known and very small quantities will cause intense suffering and often death. There are indeed, several other species of the genus that are very poisonous, e. g., *Amanita muscaria* -fly agaric and *A. pantheriana* - warted agaric, etc. which are intensely poisonous.

Lepiota cristata - crested agaric, and several other small species of Lepiota are regarded with suspicion and should be avoided. *Volvaria gloiocephala* - glutinous agaric and its allied mushrooms have always been regarded as poisonous, but there is recent evidence that they may be eaten without ill effects.

Psalliota xanthoderma - yellow staining mushroom has caused illness in some cases.

(d) **Lichens.** Very little is known about these symbiotic organisms which consist of algal cells enveloped by the mycelium of the fungus forming a felted mass. Although this group is not to be regarded as a serious menace to livestock, cases of poisoning due to *Parmelia* and *Cretaria* species, etc. are mentioned in foreign literature. *Parmelia molliuscula* has been said to effect sheep and cattle, producing lack of coordination of the hind limbs. In more severe cases the animal lies down and is unable to move either its front or hind limbs. Little or no information is available about lichens in India and even their systematic botany has not been sufficiently worked out.

(e) **Bryophyta** (Liverworts and Mosses). This is the least-known group of plants from the view-point of poisoning and there is little to be said about it.

(f) **Pteridophyta** (Vascular Cryptogams). This group includes ferns and allied plants but unfortunately little or no work has been done in India with regard to their toxicity. Greshoff and others have reported

the presence of hydrocyanic acid in a number of ferns, especially when young. References to the supposed poisonous properties of the bracken fern (*Pteris aquilina*) have appeared in the literature for a long time, and Stockman in great Britain showed that it is poisonous to cattle when eaten in considerable quantities. The plant is found in India. ***Aspidium filix-mas***, the male fern, is suspected of being poisonous. The roots are used in medicine and large quantities of it produce haemorrhagic gastro-enteritis, tremors, weakness, stupor coma, acute nephritis, and cystitis. Six drachms of the oleoresin have proved fatal in man and three ounces in the cow. This fern is not found in India, but there are several other foreign species of Aspidium which are also suspected of being poisonous. The present authors have examined Indian representatives of these plants. Some foreign species of Osmunda, Davallia and Adiantum are also suspected of being poisonous and medicinally active. The following ferns growing in the North Western Himalayas have been examined and found to be active as anthelmintics.

Name of Ferns	*Locality*	*Active principles*		
Dryopteris odontoloma	Kashmir & Mussoorie	Up to B.P. & U.S.P. standard		
D. barbigera	Kashmir	do	do	do
D. marginata	Kashmir	do	do	do
D. blanfordii	Chamba	do	do	do
D. schimperianum	Mussoorie	do	do	do
D. calcarata	Mussoorie	Not up to standard		
D. marginata	Mussoorie	Up to standard		

Some of the foreign species of ***Equisetum*** (horsetail) have long been recognized in foreign countries as injurious to cattle and horses. They produce an intoxication in which the animals stagger about and wander aimlessly. There is no information available in India with regard to the Indian horsetail *Equisetum arvense*, but several European and American workers are convinced that it is definitely poisonous to horses, while others hold a contrary opinion. This plant grows commonly in certain places in India where it might be a menace to livestock.

CHAPTER VIII.

II. TOXICOLOGICAL ASPECTS OF PHANEROGAMS (THE FLOWERING PLANTS)

After having given a very brief survey regarding the toxicological aspects of the Cryptogamic flora we will now take up the Phanerogams or the flowering plants. Economically this is the most important group both for man and animals from the point of view of everyday necessities of life, e.g., food, medicines, etc. It is probably on account of this that more information is available with regard to this group.

From a toxicological point of view the Phanerogams may be divided into two main groups.

I. Plants poisonous to man and livestock.

(a). **Medicinal Plants** :—Primitive man in the quest for food must have come across plants containing poisonous principles by accident and by experience must soon have learned to avoid them. He even made use of them for the purpose of fighting against his enemies and for procuring his food by killing animals with them. On the whole, our knowledge is fairly well advanced so far as the relationship of poisonous plants have been used for criminal purposes from ancient times but the majority of them are used as medicinal agents for the amelioration of human suffering. It is well known that many plants that are harmful to life in large quantities, produce remarkably beneficial effects in small regulated doses in disease conditions. From the economic point of view, the abundance of this group of plants in our midst is of very great importance in as much as it provides us with medicinal agents of every description, not only sufficient for our own use but also for purposes of export. We have already given brief review of the work done on this group.

(b). **Poisonous to livestock.** The second important aspect of these plants is in connection with other countries, our knowledge is very meagre. In India, there are hundreds of plants that are intimately connected with the food supply of the bovine population such an essential factor in connection with agriculture and food supply. The fodder required for this livestock amounts to about fifty million maunds daily (excluding the concentrates that are in use). Even in its present unsatisfactory condition, the cattle industry contributes very largely to the annual agricultural income of this vast country. Its welfare is therefore of the utmost importance. There is no doubt that the mortality among cattle through poisoning in India is very large. Unfortunately no figures are available of the loss suffered on this account but it must be enormous.

Even in a country like the United States of America where knowledge with regard to Poisonous Plants is well advanced as compared to India, great losses are incurred every year through the poisoning of cattle. The loss occuring in this sub-continent can thus be imagined.

Though the number of plants which are known to have markedly poisonous properties is perhaps small as compared with the total species included in the Indian floras, there are many which are of common occurrence and which no doubt produce serious losses by death or illness among sheep, cattle and other domestic animals. The toxic effects produced may be indicated by reduction in the yield of milk, the milk may become unpalatable through excretion in it of toxic products, or it may even become unfit for consumption. Some time even the meat of these animals becomes poisonous.

It may be stated here that animals do not instinctively select toxic plants as forage, that all classes of livestock are not necessarily equally susceptible to the same poisonous plants, that not all poisonous plants are dangerous from their initial appearance up to maturity and that in some the animals do acquire a depraved appetite for harmful plants, especially when the fodder supply is scarce, a condition which is of frequent occurrence in many parts of India. The losses in many cases may be avoided by increasing our knowledge about these plants.

Prevention. The question arises as to what should be done to prevent poisoning by plants. The adage 'prevention is better than cure' is applicable to the problem of plant poisoning with just as much force as in other spheres. Often cases are brought to notice when the symptoms have developed and the poison has already circulated in the blood stream and has done irreparable damage to the system. Increased knowledge of the poisonous plants is the first step in this direction and this is sure to have an effect in decreasing fatalities among human beings and livestock. It is for this reason that Indian Council of Agricultural Research and Indian Council of Medical Research have encouraged research on this group. Keeping the animals always as far as possible from dangerous areas and exercising special care during periods of drought are likely to decrease the mortality amongst livestock. Eradication of poisonous plants is a difficult matter, involving an enormous amount of labour and capital, but wherever and whenever possible it should be resorted to. This depends upon the habits of the particular plant. Such plants may be annual, biennial or perennial herbs, or shrubs or trees. Annuals should be pulled out or dug out before seeding and biennials may be dealt with as the annuals. Perennial are propagated both by the seeds and by the underground organs, such as tubers, rootstocks, bulbs, etc. and may be dug out if not deeply rooted. Shrubs are woody perennials and should be cut down or dug out. Cutting down of lower branches of trees within the reach of animals or children is advocated.

The indiscriminate importation of ornamental plants has recently increased the number of poisonous plants in India. Some of these do not find much competition in their adopted home and are likely to spread in this country at an enormously rapid pace. The time is now ripe to agitate for a law prohibiting the importation of poisonous plants for gardens or to take measures to forbid the cultivation of those already introduced. The foodstuff dealers should make sure that adulteration is not practised either with poisonous plants or with plants whose properties are doubtful. Recent work in connection with the causation of epidemic dropsy has shown that in some epidemics, mustard oil adulterated with 'katakar' oil from the seeds of *Argemone mexicana* Linn., the mexican poppy or 'Shialkata', was the cause of the outbreak.

Food Poisons. There is a number of common articles of food which produce poisoning in man and animals and a brief reference may be made to these.

(1) **Khesari dal, Lathyrus sativus** Linn., an important article of diet in man and animals, has been responsible for a large number of cases of poisoning under certain conditions in man, cattle, sheep, pigs, horses, pigions, ducks etc. Examples of lathyrism in man in the form of spastic paralysis are commonly seen every day in the streets of Calcutta and towns in Bihar and its toxic effects in horses and cattle are well known. Moderate amounts of this pulse can be taken with impunity, but large amounts, especially to the exclusion of other fodders or foods, produce poisoning.

(2) Grasses (Gramineae) form an important part of the food of animals. Some of these develop dangerously large quantities of hydrocyanic acid under certain climatic and soil conditions especially at times of drought or when the plants are wilting, stunted or young. Unfortunately our knowledge of Indian grasses in this connection is meagre and it is not possible to estimate the losses in livestock from this source.

The common Jowar (*Sorghum vulgare* Pers.), the Indian millet, is largely cultivated as fodder for cattle and also for human food. It has caused serious outbreaks of poisoning among livestock when wilted or stunted under drought conditions. *Sorghum halepense* Pers., a tall perennial grass, with creeping rhizomes and numerous suckers, known as Johnson grass, grows all over India under the name of 'baru' in Hindi and 'Kala-mucha' in Bengali. It has been responsible for serious losses among livestock during recent years in the North-Western parts of India. It has been stated that the amount of hydrocyanic acid in these plants decreases with the age of the plant but never entirely disappears. The points to be remembered about these grasses are that they are dangerous during wilting and under conditions of draught, that the younger and more succulent ones are often more likely to contain lethal doses of hydrocyanic acid and that if well dried, these plants are generally not dangerous. The toxicity in the case of cyanogenetic compounds depends on the quantities of hydrocyanic acid liberated, and according to the amount and speed at which they are eaten. Often such large quantities are given that the animal will die before any veterinary aid can be given. The only remedy is prevention. The problem of poisonous grasses is of great economic importance in certain parts of India where rains often fail and drought conditions prevail.

The workers of the Drug Research Laboratory have been engaged in carrying a survey of grasses occurring in the North Western Himalayan Region. About 150 different species have been collected and are now being studied with regard to their nutritive values and possible poisonous properties. A number of poisonous grasses have been discovered which the cattle of these parts instinctively avoid, but new-comer gets poisoned. *Stipa siberica* commonly growing on hills round Kashmir Valley is an example and there are others.

(3) The linseed plant, *Linum usitatissimum* Linn., contains a cyanogenetic glucoside, the maximum amount of which is reached very early in the development of the plant and finally disappears, except in the seed, which

still contains small quantities. An oil is expressed from the seeds and the remaining cakes are used to feed livestock. Cases of poisoning have been frequently reported amongst animals feeding on this plant. It is unsafe to feed the cattle on the immature plant, especially when it is wilted. The cake after extraction of the oil should be treated with boiling water to destroy the enzyme responsible for liberating hydrocyanic acid from the glucoside, and should not be soaked in cold water overnight. It should be given only in small quantities at a time.

(4) The *mustard cake* which is fed to cattle after the extraction of oil may produce chronic irritant poisoning, colic, lassitude, etc., if fed in large amounts and over prolonged periods on account of the liberation of an essential oil by the action of an enzyme on the glucoside contained therein.

(5) Several members of the cucumber family (*Cucurbitaceae*) are edible but bitter varieties are occasionally met with. The latter have a strong purgative action and should be discarded. Incidentally it may be remarked that most of the wild members of the family are toxic. Colocynth which is a powerful intestinal irritant is a familiar example. The bitter members of this family have more or less a similar action.

(6) The potato, *Solanum tuberosum* Linn., when sprouting, produces dangerously large quantities of the toxic alkaloid, solanine, and must be thrown away. Certain plants, such as buck-wheat (*Fagopyrum esculentum* Moench.) is largely cultivated for human and animal consumption, under certain conditions not yet fully understood, become toxic and give rise to inflammatory swellings of the face, eyelids and ears.

Reputed Poisonous Plants of India including Insecticidal, Piscicidal and Abortifacient.

Ranunculaceae
(Buttercup Family)

Anemonin, aconitine, indaconitine, pseudaconitine, adonidin, delphinine, staphysagroine, cyanogenetic glucosides, essential oils, saponins, etc.

1. **Aconitum balfourii** Stapf. (Vern:- Nep.- Gobari), *A. chasmanthum* Stapf. ex Holmes (Vern:- Kash.-Banbalnag), *A. deinorrhizum* Stapf. (Vern:- Mohra, Maurabikh), *A. elwesii* Stapf. *A. falconeri* Stapf. (Vern:- Bis, Bikh, Meetha-tellia), *A. ferox* Wall. ex Seringe, (Vern:- S.- Visha, H. & B.-Bish, Bo.-Vachnag, M.-Vashanavi), *A. laciniatum* Stapf. (Vern:- Kalo bikhmo), *A. laeve* Royle, *A. lethale* Griff., *A. luridum* Hk. f. & T., *A. moschatum* Stapf, *A. soongaricum* Stapf. *A. spicatum* Stapf. (Vern:- Bikh, Kalo bikhoma donghi), *A. violaceum* Jacq.

   These are all cardiac depressant and nerve poison. Cause deaths among livestock and are also used as arrow poison. Used in Hindu Medicine after mitigation as cardiac tonics. Mitigation or correction generally consists in boiling the aconite roots with cow's urine.

2. **Actaea spicata** Linn.

   It is acrid and poisonous and deaths among horses are reported

3. **Adonis aestivalis** Linn., *A. chrysocyathus* H. f. & T.
These are poisonous to animals and act as poison to heart.

4. **Anemone obtusiloba** D. Don. (Vern:- P.-Rattanjog)
It is a vesicant and when taken internally produces vomiting and purging; drying alters properties.

5. **Aquilegia vulgaris** Linn.
It is poisonous to animals.

6. **Caltha palustris** Linn.
It is acrid and poisonous and deaths among horses are reported.

7. **Cimicifuga foetida** Linn. (Vern:- P.-Jiunti)
It is a heart depressant and acts as insect repellent.

8. **Clematis gouriana** Roxb., *C. graveolens* Lindl., *C. napaulensis* DC. (P.-Oandak), *C. orientalis* Linn., *C. triloba* Heyne (Vern:- S.- Laghukarni, H. & Bo- Moravela): *C. wightiana* Wall.
These are irritant and produce blisters; such properties are altered by drying.

9. **Delphinium brunonianum** Royle. (Vern:- P.-Laskar), *D. caeruleum Jacq.* (Vern:- P.-Dhakangu), *D. elatum* Linn., *D. vestitum* Wall.
These are cardiac and respiratory depressants, acrid in taste, insecticidal and poisonous to animals.

10. **Nigella sativa** Linn. (S.-Krishnajiraka, H. & B.-Kalajira, Bo.- Kalenjire, M.-Karun-shiragam).
Produces abortion in larger doses.

11. **Paeonia emodi** Wall. Vern:- H.-Udsalap, P.- Mamekh).
It is said to have narcotic properties.

12. **Ranunculus arvensis** Linn. (Vern:- P.- Chambul), *R. falcatus* Linn., *R. laetus* Wall., *R. lingua* Linn., *R. pensylvanicus* Linn. f., *R. sceleratus* Linn. (Vern:- Pers.- Kabiraj).
These are vesicant and poisonous to livestock when fresh; drying alters these properties.

Magnoliaceae

(Magnolia and Champa Family)

Shikimin, illicin, essential oils.

13. **Illicium griffithii** Hk. f. & T., *I. anisatum* Linn., (-*I. religiosum* Sieb. & Zucc.) (Vern:- H.-Anasphal, Bo.-Badian, M.-Anashuppu).
This is the star anise of China (*I. verum* Hook.f.) which was imported into India sometimes adulterated with *I. religiosum*; it has produced deaths. The latter is respiratory and cardiac poison. Indian *I. griffithii* is also referred to as being poisonous.

Annonaceae
(Custard apple Family)

Resin, alkaloid, etc.

14. **Annona reticulata** Linn. (Vern:- H.-Lona, B.-Nona, Bo.-Ramphal, M.-Ramsita), *A. squamosa* Linn. (Vern:- S.- Gandhagatra, H.- Sitaphal, B.-Ata, M.- Sitapalam).

The seeds are intensely irritant to the conjunctiva; applied locally they act as abortifacient. They have insecticidal properties. Roots act as drastic purgative.

Menispermaceae
(Moonseed Family)

15. **Anamirta cocculus** (Linn.) W. & A. (Vern:- S.-Kakaphala, H. & B.- Kakmari, M.-Kakkay-kolli-virai).

It is a convulsant poison to animals. It acts as an insecticide and it is also used to poison fish and cattle.

16. **Pachygone ovata** (Poir.) Miers.

It is an insecticide and piscicide.

Berberidaceae
(Berberry Family)

Berberine, podophyllum resin.

17. **Berberis aristata** DC. (Vern:-S.-Daru haridra, H.-Dar-hald (and probably few more species)

It is poisonous to lower animals and is a fish poison.

18. **Podophyllum hexandrum** Royle. (*P. emodi* Wall. ex Hk. f.et.T.)

It contains a resin which is a drastic purgative and is irritant to the mucous membranes.

Papaveraceae
(Poppy Family)

Morphine, codeine, papaverine, berberine, argemone oil, etc.

19. **Argemone mexicana** Linn. (Vern:- S.-Srigala-kantaka, H. & B.- Sialkanta, M.-Birama-dandu).

The oil expressed from its seeds is occasionally mixed with mustard oil which has been held responsible for producing symptoms resembling epidemic dropsy.

20. **Meconopsis aculeata** Royle. (Vern.- Simla.- Kanta), *M. napaulensis* DC.

The roots are considerd to have narcotic properties.

21. **Papaver dubium** Linn., *P. nudicaule* Linn., *P. rhoeas* Linn. (Vern:- S.-Rakra-posta, H.-Lalpost, Bo.-Janglimudrika, M.- Shivappu-postaka chedi), *P. somniferum* Linn. (Vern:- S.-Ahiphena, H. & B.-Afim, Bo.-Aphu, M.-Postakatol)

All species yield opium more or less but *P. somniferum* is the chief source. Opium has been used for suicidal purposes.

Cruciferae

(Mustard Family)

Glucocides on contact with water produce vesicant active essential oils.

22. **Brassica cernua** (Thunb.) Forbes et Hemsl., *B. integrifolia* (West) O. E. Schulz, *B. juncea* (Linn.) [Czernjaew et cosson (rai); *B. napus* Linn. with four varieties (Toria, sarson), *B. nigra* (Linn.) Koch (black mustard).

Seeds of these are vesicant, and mustard cakes if fed in large quantities and over prolonged periods is harmful to cattle. Sarson cake is safest; mixture with rai or black or white mustard dangerous.

23. **Lepidium draba** Linn. (Vern:- Afgh.-Bijindak)

It is a fish poison.

24. **Sinapis alba** Linn. (white mustard)

It is discussed under Brassica.

Capparidaceae

(Caper Family)

Essential Oils.

25. **Capparis decidua** Edg. (*C. aphylla* Roth.) (Vern:- S.-Karira, H.-Karer, P. Karia, Bo.-Kari, M. Karyal).

It acts as a vesicant.

26. **Cleome felina** Linn. f.*C. viscosa* Linn.; (Vern.-S.-Swarnakshira).

It acts as a vesicant.

27. **Gynandropsis gynandra** (Linn.) Merr. (*G. pentaphylla* DC.)

It is an insecticide and a piscicide. It has vesicant properties.

Bixaceae

(Chaulmoogra family)

Cyanogenetic glucoside, chaulmoogra oil.

28. **Gynocardia odorata** R. Br. (Vern:-H., B. & Bo.-Chaulmoogra)

The fruit acts as a piscicide.

29. **Hydnocarpus kurzii** (King) Warb. (-*Taraktogenos kurzii* King), *H. laurifolia* (Dennst.) Sleumer (-*H. wightiana* Bl.)

The fruit acts as a piscicide and the seed oil is gastro-intestinal irritant.

Polygalaceae

(Milkwort Family)

Saponins.

30. **Polygala chinensis** Linn. Vern.-H.-Meradu, Bo.-Negli), ***P. crotalarioides*** Buch.-Ham. (Vern:-Santh.-Lil kathi), ***P. telephioides*** Willd.

It has an acrid taste and is an emetic. It has expectorant properties.

Caryophyllaceae

(Carnation Family)

Saponins.

31. **Saponaria vaccaria** Linn. (Vern :- H.-Musna, B.-Sabuni) and probably some others of the family.

It is acrid and its toxicity is partially removed by boiling.

Hypericaceae

(St. John's wort Family)

Balsamic resinous juice.

32. **Hypericum perforatum** Linn. (Vern:-H. & P.-Basant)

It is poisonous to animals, especially horses if taken in excess, usually it is not eaten.

Guttiferae

(Gamboge Family)

Gum resins.

33. **Calophyllum inophyllum** Linn. (Vern :-S.-Punnaga, H. Sultana, champa, B.-Punnag, Bo.-Undi, M.-Punnagam).

It is a fish poison.

34. **Garcinia morella** Desrouss, and probably others.

It yields a gum resin which is a violent gastro-intestinal irritant.

Ternstroemiaceae

(Tea Family)

Caffeine, theophylline

35. **Thea sinensis** Linn.

Its excessive indulgence only is harmful.

Malvaceae

(Cotton family)

Gossypol, resin, ephedrine, pseudo-ephedrine.

36. **Gossypium** species.

The root bark is emmenagogue and used as abortifacient; occasionally harmful effects of cotton seed cakes on animals have been reported.

37. **Malva parviflora** Linn. (Vern:-H. Panirak).

It is reported to have produced narcotic poisoning in animals.

38. **Sida rhombifolia** Linn. (Vern:- S.-Atibala, H. & B.-Swet-berela, M.-Athiballachetu).

The ripe capsules are reported to be fatal to fowls.

Linaceae

(Flax Family)

Cyanogenetic compounds, cocaine.

39. **Erythoroxylum coca** Lam.

It is a central nervous stimulant; sensory nerve endings-paralysant; addiction to it is harmful.

40. **Linum usitatissimum** Linn. (Vern:- S.-Atasi, H. & B.-Tisi, Bo.-Alasi, M.-Alshiviral).

The young plants are known to produce deaths in animals; sometimes seed cakes also harmful.

Zygophyllaceae

(Bean-caper and Guaicum Family)

Harmine, harmaline, harmalol, peganine, essential oils, saponins, resins.

41. **Peganum harmala** Linn. (Vern.-H. & Bo.-Hurmal, B.-Isband, M.-Shimai-azha-vanai-virai).

It is an insecticide, narcotic, nauseant and emetic. It is used as abortifacient. It is a protoplasmic poison and paralyses skeletal and cardiac muscles of frog.

42. **Tribulus terrestris** Linn. (Vern.-S.-Gokshura, H.-Chotagokhru, B.-Gokhuri, Bo.-Lahana-gokhru, M.-Nirunji).

It causes the disease goeldikkop (dikgeel) in South Africa in small stock which is characterized by oedema of head, fever and jaundice.

Rutaceae

(Rue Family)

Essential oils, rutin, skimmianine, saponins, resins, etc.

43. **Acronychia pedunculata** (Linn.) Miq. (-*A. laurifolia Bl.*)
It is a fish poison.

44. **Ruta graveolens** Linn. var. *angustifolia* Hk.f., (Vern:- S.-Somalata, H.-Sadab, B.-Ermul, B.-Satap, M.-Arvada), *R. tuberculata* Forsk.

These are acro-narcotic poisons which are rubefacient. The oil and herb frequently used to produce criminal abortion.

45. **Skimmia laureola** Sieb. & Zucc. ex-Walp. (Vern:- Nep.-Chumlani, P.-Ner).

It is reported to be poisonous to sheep and goats.

46. **Zanthoxylum alatum** Roxb. (Vern:- S.-Tumburu, H.-Tejmal, B.-Nepali dhania) (Probably some more species).

It is a fish poison.

Simaroubaceae

(Bitter-bark Family)

Essential oils, saponins, resins, bitter substances.

47. **Ailanthus altissima** (Mill.) Swingle (—*A. glandulosa* Desf).

It is nauseant and nervous system depressant. Accumulation of its leaves in well water is reported to produce chronic gastritis.

48. **Balanites aegyptiaca** (Linn.) Delile (—*B. roxburghii* Planch.) (Vern:-S.-Ingudi, H. & B.-Hingan, Bo.-Hinger, M.-Najunda).

It is believed to be a fish poison and a purgative.

49. **Brucea amarissima** (Lour.) Merr.- (*B. sumatrana* Roxb.)

Its seeds produce nausea, vomiting, abdominal pain and purging.

50. **Picrasma napalensis** Benn.

It is stated to be used as larvicide in Sikkim.

Meliaceae

(Neem and mahogany Family)

Bitter substances, bitter oil, saponins.

51. **Azadirachta indica** A. Juss.

It is parasiticidal and the leaves are used as insect repellent.

52. **Melia azedarach** Linn.

Its berries are especially poisonous to man and animals; they are narcotic and gastro-intestinal irritant.

53. **Walsura piscidia** Roxb. (Bo. & M.-Walsura).

It is a dangerous emmenagogue and a violent emetic. It is largely used as a fish poison.

Celastraceae

(Spindle-tree Family)

Alkaloid, essential oil, resin.

54. **Elaeodendron glaucum** Pers. (Vern:-H.-Bakra, Bo.-Bhuta-pala, M.-Selupa.)

It is emetic; overdoses fatal.

Sapindaceae
(Soap-nut Family)

Saponins, cyanogenetic compounds.

55. **Cardiospermum halicacabum** Linn. (Vern:-S.-Karnaspota, H.-Kanaphata, M.-Mooda cotton).

Its leaves are emetic and rubefacient.

56. **Dodonaea viscosa** Linn. (Vern:-H.-Aliar, Bo.-Bandurgi, M.-Virali).

It is fish poison; it is deleterious to camels.

57. **Harpullia cupanioides** Roxb.

It is a fish poison.

58. **Melianthus major** Linn.

It produces acute diarrhoea, salivation and colic; honey from flowers stated to be poisonous.

59. **Sapindus mukorossi** Gaertn. (Vern:-S.-Phenila, H. B. & Bo.-Ritha), *S. trifoliatus* Linn. (Vern:-S.-Phenila, H. B. & Bo.-Ritha, M.-Ponnan-kottai)

Both are fish poisons, emetic, purgative and are used for procuring abortion.

60. **Schleichera oleosa** (Lour) Merr. (*S. trijuga* Willd.) (Vern:-H.-Kosum, M.-Pu-maram).

The oil is occasionally mixed with mustard oil or ghee. It produces irritant poisoning and the seeds are used as insecticide.

Anacardiaceae
(Cashew and mango Family)

Toxic phenolic compounds, toxic resin.

61. **Anacardium occidentale** Linn. (Vern:-H. & Bo.-Kaju, B.-Hijli badam, M.-Mundiri-kai).

The pericarp contains powerfully vesicant juice, used to preserve floors, wood, books, etc. from white ants; tar from bark also vesicant.

62. **Holigarna arnotiana** Hook. f. (Vern :-Bo.-Bibu), *H. ferruginea* March, *H. grahamii* (Wight) Hook. f., *H. longifolia* Buch. Ham. ex-Roxb. (Vern:- B.-Barola, Bo.-Hulugiri).

The juice is vesicant although not equally powerful in all species.

63. **Rhus insignis** Hook. f., *R. punjabensis* J. L. Stewart, *R. succedanea* (Vern. :-S.-Karkata sringi, H. & B.-Kakrasingi, Bo.-Takadasingi), *R. wallichii* Hook. f. (Vern :-Nep.-Ghosi, H.-Akoria.)

Dreaded by local people; even smoke from burning wood is considered poisonous; its juice is vesicant.

64. **Semecarpus anacardium** Linn. f. (Vern :-S.-Bhallatamu, H. & B.-Bhela, Bo.-Biba, M.-Shayrang), *S. travancoricus* Bedd.

The pericarp contains vesicant juice. It is used in some parts as abortifacient.

Coriariaceae

(Coriaria Family)

Coriamyrtin, tutin in foreign species.

65. **Coriaria nepalensis** Wall.

It is stated to be narcotic; the foreign species are very poisonous acting like picrotoxin and producing convulsions.

Moringaceae

(Horse-radish Family)

Essential oils, alkaloid, moringine, moringinine.

66. **Moringa oleifera** Lamk. (—*M. pterygosperma* Gaertn.) (Vern:-S.-Sobhanjana, H.-Sajnah, B.-Sojna, Bo-Sujna, M.-Murungai).

The fresh root bark is said to be vesicant and is used to procure abortion. Moringinine acts on sympathetic nervou, system.

Leguminosae

(Pea Family)

Alkaloids; glucosides, saponins, cyanogenetic compounds, rotenone, toxic albumin, bitter substances ; globulins.

67. **Abrus precatorius** Linn. (Vern :-S. & Bo.-Gunja. H.-Gaungchi B.-Kunch, M.-Gundumani)

It is specially a blood poison and is used to poison cattle and to procure abortion.

68. **Acacia pennata** Willd. (H.-Biswul, Kumaon.-Agla, Nep.-Arfu). It is a fish poison.

69. **Albizzia procera** Benth. (Vern :-H.-Safed siris, B.-Kori, Bo.-Kinai tihiri, M.-Konda vaghe).

It is a fish poison.

70. **Butea monosperma** (Lam.) O.Ktze. (—*B. frondosa* Koen. ex-Roxb.) (Vern :- S.-Kinsuk, H. & B.-Palas).

Its seeds are insecticide and painful if taken internally.

71. **Caesalpinia nuga** Ait. (Vern :-M.-Kakumullu). It is a fish poison.

72. **Canavalia virosa** W. & A. (*C. ensiformis DC.* var. *virosa* Baker. (Vern :-M.-Kattuvalari).

Its fruit is stated to be poisonous.

73. **Cassia absus** Linn. (Vern :-H.-Chaksu, M.-Karun Kanam), *C. acutifolia* Delile, *C. alata* Linn., *C. angustifolia* Vahl, *C. fistula* Linn., *C. obovata* Collad. (Vern:—Surati sonnamukai).

These are all purgatives which are irritant in large doses. *C. absus* seeds are irritant application to eyes, and *C. alata* is a fish poison.

74. **Clitoria ternatea** Linn. (Vern:-S.-Aparajita, H. & B.-Aparajit, M.-Kakkanan).

The roots are powerful cathartic like Jalap; not a safe medicine.

75. **Cytisus scoparius** Linn.

The plant is not eaten by cattle. It is an emetic and a cathartic.

76. **Dalbergia stipulacea** Roxb.

It is a fish poison.

77. **Derris elliptica** Benth. (Vern :-Malay.-Tubah), *D. scandens* Benth. (Vern :-B.-Noalata, P.-Gunj, M.-Nala tige), *D. uliginosa* Benth. (Vern :-B.-Panlata, Bo.-Kirtana), (possibly *D. ferruginea* Benth.)

These are all fish poisons and *D. elliptica* is a powerful insecticide.

78. **Entada phaseoloides** (Linn.) Merr. (—*E. scandens* Benth.) (Vern :-H.-Chian, B.-Gilagach, Bo.-Gardal).

It is a fish poison.

79. **Lathyrus aphaca** Linn., *L. sativus* Linn. (Vern:-S.-Triputi, H. & B.-Khesari, Bo.-Lakh).

It is a food and fodder. *L. sativus* if taken in large amounts and over prolonged period produces lathyrism in man and animals. Ripe seeds of *L. aphaca* are stated to be narcotic if taken in excess.

80. **Melilotus alba** Desr.

It is stated to be poisonous to cattle.

81. **Milletia auriculata** Baker, *M. pachycarpa* Benth., *M. piscidia* Wight.

These are fish poisons. *M. auriculata* is an insecticide.

82. **Mundulea suberosa** Benth.

It is a fish poison.

83. **Ougenia dalbergioides** Benth. (Vern :- S.-Tinisasegandun, H.-Sandan, B.-Tinis, Bo. Tiwas, M-Tella-motuku).

It is a fish poison.

84. **Phaseolus lunatus** Linn.

The coloured variety sometimes exhibits poisonous properties if eaten.

85. **Pithecellobium bigeminum** Mart. (Vern :-H. & Bo.-Kachlora).

It is a fish poison. The seeds are stated to be eaten in Burma but sometimes produce severe poisoning.

86. **Pongamia pinnata** (Linn.) Merr. (—*P. glabra* Vent.) (Vern:- S., H. & Bo.-Karanja, B. Dahar karanja, M.-Pungammaram).

It is piscicide and insecticide.

87. **Sophora mollis** R. grah. var. *Hydaspidis* Baker, *S. tomentosa* Linn.

The Seeds of *S. mollis* have insecticidal properties and the leaves of *S. tomentosa* are powerfully emetic and cathartic in large doses.

88. **Tephrosia candida** Linn., *T. purpurea* Pers. (Vern:- S.-Sarapunkha, B.-Bon-nil, H. & Bo.-Sarphankha, M.-Kolluk-kay-velai).

These are fish poisons. Some foreign species are insecticides. Some species of Tephrosia in India are likely to prove of value as insecticides.

89. **Trifolium repens** Linn.

It is highly prized fodder in Europe. In the Himalayas poisoning has been reported in horses.

90. **Vicia sativa** Linn. (Vern:-H.-Ankra, B.-Ankari).

It is suspected to be the cause of lathyrism.

Rosaceae

(Rose family)

Cyanogenetic glucosides, phloridzin.

91. **Prunus amygdalus** Batsch. (bitter variety). (Vern:-H., B. & Bo.-Badam, M.-Vadam-Kottai), *P. armeniaca* Linn. (Vern:-H.-Khubani, P.-Gurdlu), *P. avium* Linn., *P. cerasus* Linn., *P. mahaleb* Linn. (Vern :-S., Priyangu), *P. padus* Linn. (Vern:-H.-Jamana, P.-Jamma), *P. persica* Stokes, (Vern:-H.-Aru), *P. puddum* Roxb., (Vern:-S.-Padmaka, H.-Paddam, Bo.-Padma-kasta), *P. undulata* Buch.-Ham.

The seeds are poisonous and the leaves of many species are said to be dangerous to live-stock when wilted; harmless when on the plant, suspicious when dried.

92. **Pygeum gardneri** Hook. f.

The seeds are fish poison.

93. **Pyrus aucuparia** Linn., *P. malus* Linn.

The bark of *P. aucuparia* is irritant to the alimentary tract and wilting leaves of other species are occasionally poisonous to animals browsing upon them.

94. **Rubus moluccanus** Gaertn. (Vern:-Kumaon.-Katson).

The leaves are reported as powerful emmenagogue and abortifacient.

Crassulaceae
(Life-Plant-Family)

Glucosides-in foreign species.

95. **Kalanchoe spathulata** DC. (Vern:-H.-Tatara).

The expressed juice of bitter variety is a drastic purgative and is poisonous to goats. It is not eaten by cattle. Leaves are said to be insecticidal.

Droseraceae
(Sundew Family)

Organic acids, proteolytic enzymes.

96. **Drosera peltata** Sm. var. *lunata* Clarke, (Vern:- H.-Mukajali, P. Chitra), *D. spathulata* Labill. (*D. burmanni* Vahl.).

These are rubefacient. Some Australian species are reported to be injurious to sheep.

Combretaceae
(Myrobolan Family)

Tannins.

97. **Terminalia bellerica** Roxb. (Vern:-S.-Bahira, H. & B.-Bahera, Bo.-Behaira, M.- Vallaimurdu), *T. chebula* Retz. (Vern:- S. & B.-Haritaki, H.-Harara, Bo.- Hirda, M.- Kadukkay-pu)

T. bellerica is reported to be fish poison. The kernel is stated to be poisonous and cases are reported where narcotism followed nausea and vomiting. Some varieties of *T. chebula* are drastic purgatives.

Myrtaceae
(Myrtle and jamun Family)

Saponins, essential oils, tannins.

98. **Barringtonia acutangula** Gaertn. (Vern:- S. - Dhatriphal, B.-Hijal, H.-Hijjal, Bo.-Samudraphala, M.-Samutrapullam), *B. asiatica* Kurz. (*B. speciosa* Forst.), *B. racemosa* Bl. (Vern:- S.-Samudrapad, H.-Norvishee, B.-Samudraphal, M.-Samudra).

These are believed fish poisons.

99. **Careya arborea** Roxb. (Vern:-S., H. & B.-Kumbhi).

It is a fish poison. The inner bark rubbed on shoes keeps off leeches.

100. **Eucalyptus globulus** Labill. (Vern:- M.-Karpura maram)

The essential oil contained is an important ingredient of insecticides; internally gastro-intestinal irritant.

101. **Melaleuca leucadendron** Linn. (Vern:- H., B. & Bo.-Nim, M.-Vembu)

Its essential oil is an irritant and a mosquito repellent.

Lythraceae

(Henna and pomegranate Family)

Acrid principle.

102. **Ammannia baccifera** Linn. (Vern:- S.- Agnigarva, H.- Jangli-mendi, M.- Nirumel-neruppu) *A. senegalensis* Lamk. (Vern:- P.- Fauglimehandi).

These are vesicant ; taken internally they cause great pain.

103. **Lagerstroemia indica** Linn., *L. speciosa* (Linn.) Pers. (-*L. flosreginеae* Retz.) (Vern:- S.- Arjuna, H. & B.-Jarul, B.- Taman, M. Kodali).

The bark and leaves are purgative; seeds of the former species are narcotic.

Samydaceae

(Casearia Family)

104. **Casearia graveolens** Dalz. (Vern:- H.- Chilli, Bo.- Naro), *C. tomentosa* Roxb. (Vern:- H.- Chillara).

The pounded fruit is used as a fish poison.

Caricaceae

(Papaw Family)

Carpaine, carposide, caricin in seeds yielding essential oil on hydrolysis; papain.

105. **Carica papaya** Linn. (Vern:- H.- papaya, B.-Papey, Bo.-Papai, M.- Pappayi).

The seeds are believed to have powerful emmenagogue properties and are used as abortifacient. The juice of unripe fruit is acrid or even vesicant.

Passifloraceae

(Passion-flower Family)

Hydrocyanic acid, saponins

106. **Adenia (modecca) palmata** Engl., *A. wightiana* Engl.

The roots and fruits are poisonous. Deaths from eating fruits of *A. palmata* are reported.

Cucurbitaceae

(Cucumber Family)

Bitter substances, such as colocynthin, alkaloids, glucosides.

107. **Citrullus colocynthis** Schrad. (Vern :- S.-Indra varuni, H. & Bo.-Indrayan, B.-Makhal, M.-Peyt-tumatti) *C. vulgaris* Schrad. (Bitter variety).

The fruit is purgative; *C. colocynthis* is a drastic purgative and has produced fatal results; the dust when dry is very irritating to eyes and nostrils.

108. **Corallocarpus epigaeus** Benth. & Hook. f.

Its fruit is a drastic purgative.

109. **Cucumis sativus** Linn. (Bitter variety) (Vern:-S.-Sukasa, H.-Khira, B.-Sasa, Bo.-Kankri, M.-Mulluvellari), *C. trigonus* Roxb. (Vern:-S.-Vishala, H.-Bislambhi, M.-Hattut-tumatti).

The fruit is a purgative, *C. trigonus* excessively so.

110. **Lagenaria siceraria** Standl. (*L. vulgaris* Seringe) (Wild variety)

It is drastic purgative. Cases have been reported where beer kept in bottle gourd produced poisoning.

111. **Luffa acutangula** Roxb. var. *amara* C. B. Clarke (Vern:-S.-Koshataki, H. & Bo.-Torai, B.-Jhinge, M.-Pikumkai), *L. aegyptiaca* Mill. ex. Hook. f. (Vern:-S.-Rajkoshataki, H.-Ghiatarui, B.-Dhundul, Bo.-Ghosali, M.-Guttibira) (Wild variety), *L. echinata* Roxb. (Vern:-S.-Koshataki, H.-Kukarlata, B.-Ghosalata, Bo.-Kukarwele, M.-Panibira).

The fruit of *L. acutangula* var. *amara* is violently emetic and purgative and is not eaten. Others are also purgative.

112. **Momordica balsamina** Linn. (Vern:-Bo.-Kurelo-jangro), *M. charantia* Linn. (Vern:-S.-Sushavi. H.-Karela, B.-Karala, Bo.-Karla, M.-Pavakkachedi), *M. tuberosa* Cogn. (—*M. cymbalaria* Fenzl) (Vern:-Bo.-Kadavanchi).

Fruit of *M. balsamina* is fatal to dogs; death occurs from violent vomiting and purging produced by the juice of this plant. *M. charantia*, roots are used as abortifacient. Decoction of roots of *M. tuberosa* are used as abortifacient.

113. **Trichosanthes bracteata** Voigt (—*T. palmata* Roxb.) (Vern:-S.-Mahakal, H.-Lal-indrayan, B.-Makal, Bo.-Kaundal, M.-Korattai) *T. cucumerina* Linn. (H.-Jangli-chichonda, S.-Patola, B.-Bonpatol, Bo.-Ranparul, M.-Pudel), *T. dioica* Roxb. (Vern:-S.-Patola, H.-Parvar, B.-Potal, Bo.-Potala, M.-Kombupudalai).

The roots are powerful cathartic. Fruit of *T. cucumerina* is never eaten, because of powerful cathartic action. Fruit of *T. bracteata* is used as cattle poison and to destroy crows.

114. **Zanonia indica** Linn. (Vern:-S.-Dirghapattra, H.-Chirpoti, Bo.-Chiraputi, M.-Penarvalli).

The fruit is very acrid and a powerful cathartic.

Begoniaceae

(Begonia Family)

111. **Begonia rex** Putzeys.

Its juice is poisonous to leeches.

Ficoideae

116. **Trianthema portulacastrum** Linn. (*T. monogyna* Linn.), *T. pentandra* Linn. (Vern:-P. & Bo.-Bishkapra).

The roots are irritant and cathartic. The leaves and stems are used as pot herb occasionally said to produce paralysis and diarrhoea.

Umbelliferae

(Carrot and coriander Family)

Essential oils, cicutoxin, cicutoxinin, vellerin.

117. **Apium graveolens** Linn. (Vern:-S. & H.-Ajmoda, B.-Chanu).

The seeds are irritant and poisonous in large overdoses.

118. **Centella asiatcia** (Linn.) Urb. (-*Hydrocotyle asiatica* Linn.)

It is stupefying narcotic in large doses and a cumulative poison.

119. **Cicuta virosa** Linn.

The plant is the cause of extensive poisoning in Europe. The active principle belongs to picrotoxin groups of poisons which are convulsant.

120. **Daucus carota** Linn. (Vern:-S.-Shikha-mulam, H., B. & P.-Gajar, M.-Gajjara kelangu).

The seeds are used for procuring abortion and the tuberous roots are eaten.

121. **Hydrocotyle javanica** Thunb.

It is stated to be a fish poison.

Araliaceae

(Ivy and Panax Family)

Resin, a-hederin saponin.

122. **Hedera helix** Linn. (Vern:-H.-Lablab, P.-Banda, Kash.-Karmora).

The decoction made from leaves is used to kill lice and other poisonous properties are also assigned to the plant.

Caprifoliaceae

(Honey-suckle family)

Sambucine, cyanogenetic glucoside, sambunigrin, bitter substances, resin (cathartic).

123. **Sambucus ebulus** Linn., (Vern:-P.—Mushkiara), *S. nigra* Linn.

Both are strongly purgative. *S. ebulus* has foetid smell when bruised and is not eaten by cattle; poisoning amongst boys and fowls reported.

Rubiaceae

(Madder and coffee Family)

Quinine, quinidine, cinchonine, cinchonidine, caffeine, emetine, cephaeline, ipecacuanhin, essential oils, saponins.

124. **Adina cordifolia** Benth. & Hook. f. (Vern:—S.-Dharakadamba, H.-Hardu, B.-Keli kadam, M.-Manja kadambe).

Its juice is used as insecticide.

125. **Cinchona calisaya** Wedd. and var. *ledgeriana* Howard, *C. officinalis* Linn. f., *C. succirubra* Pavon.

The cinchona alkaloids are general protoplasmic poisons and parasiticide. The plants are believed fish poisons.

126. **Coffea arabica** Linn. (Vern:—H.-Coffee, B.-Kafi)

Its excessive indulgence produces harmful effects and chronic poisoning.

127. **Cephaelis ipecacuanha** Stokes.

It is emetic and irritant and a powerful cardiac depressant.

128. **Randia dumetorun** Lamk., (Vern:—S.-Madan, H.-Mainphal, B.-Menphal, Bo.-Gelaphal, M.-Maruk-kallan-kai), *R. uliginosa* DC. (Vern:—S.-Pindaluka, H.-Pindalu, B.-Piralu, Bo.-Pendari, M.- Wagata)

These are believed fish poisons. *R. dumetorum* is used to preserve grain from attacks of insects; it is also used as abortifacient.

Compositae

(Sun-flower Family)

Essential oils, artemisin, santonin, bitter substances (absinthin lactucin, etc.), saponins, resin, senecio alkaloids, xanthostrumarin, pyrethrins.

129. **Anthemis cotula** Linn.

It is an undesirable food for livestock; it is acrid and vesicant.

130. **Artemisia absinthium** Linn. (Vern:—H. & Dec.-Vilayati afsantin), *A. maritima* Linn. (Vern:—S.-Gadadhar, H.-Kirmala, Bo.-Kiramani owa), *A. vulgaris* Linn. (S.-Nagadamani, H.-Nagadouna, B.-Nagdona).

The essential oil from *A. absinthium* is a violent narcotic poison producing convulsions. *A. maritima* is an irritant poison when given in large doses, and fatal cases are reported. *A. vulgaris* produces epileptiform spasms in man and is also reported as fish poison.

131. **Centratherum anthelminticum** O. Ktze.(-*Vernonia anthelmintica* Willd.).

It is used as insecticide and insect repellent.

132. **Chrysanthemum cinerariæfolium** Vis., *C. coccineum* Willd., *C. roseum* Adam.

All are reputed insecticides.

133. **Erigeron canadensis** Linn.

It is an irritant.

134. **Eupatorium odoratum** Linn.

It is stated to be a fish poison. *E. urticifolium* L. f. of foreign countries produces acidosis and trembles in sheep and cattle.

135. **Gnaphalium luteo-album** Linn. (Vern: – P.-Balraksha).

It is suspected to produce livestock-poisoning in South Africa.

136. **Inula graveolens** Desf.

It is suspected to be poisonous to livestock.

137. **Lactuca tatarica** C. A. Meyer. var. *tibetica* C. B. Clarke.

It is occasionally browsed by sheep; sometimes injurious.

138. **Saussurea lappa** C.B. Clarke (Vern:—S.-Kushtha, H.-Kut, B.-Pachak, Bo.-Ouplate, M.-Goshtam).

The roots are used to protect woollen fabrics against insects.

139. **Senecio** *species* (*S. vulgaris* Linn. introduced plant).

The Indian species should be studied in Ragwort poisoning due to several species of this plant is well known in foreign countries; some species produce hepatic cirrhosis.

140. **Sphaeranthus indicus** Linn. (Vern:—S.-Munditika, H. & Bo.-Gorakmundi, B.-Murmuria, M.-Kottak).

It is believed to be a fish poison.

141. **Xanthium strumarium** Linn. (Vern:—S.-Arishta, H.-Chhota-gokru, B.-Bon-okra, Bo.-Shankesh-vara; M.-Marlu-mutta).

It is reported to be poisonous to cattle and pigs in America and Australia.

Campanulaceae
(Bell-flower Family)

Alkaloids.

142. **Lobelia excelsa** Leschen, *L. nicotianifolia* Heyne. (Vern:—Bo.-Dhavala, M.-Rattu papillay).

It is irritant to nose and deaths have been reported in man. Its action resembles nicotine, except that more burning pain in the stomach is produced. It is used as substitute for datura.

Ericaceae

(Rhododendron Family)

Andromedotoxin, ericolin, Essential oils.

143. **Gaultheria fragrantissima** Wall.

It is an irritant poison and deaths are reported from its use as abortifacient.

144. **Pieris ovalifolia** D. Don.

It is poisonous to goats and is an insecticide.

145. **Rhododendron anthopogon** D. Don., (Vern:—Kash.-Tazak-tsun), *R. arboreum* Sm. (Vern:-P.—Ardawal), *R. barbatum* Wall. (Vern:—Nep.-Guras), *R. campanulatum* D. Don. (Vern:-H.-Cheraelu Kash.-Gaggar), *R. cinnabarinum* Hook. f. (Vern: --Nep:-Bulu), *R. falconeri* Hook. f. (Vern:—Nep.-Kurlinga), *R. setosum* D. Don. (Vern:- Bhutia.-Tsallu).

These are probably all poisonous to live-stock; some are reported to be fish poisons and honey from some is reported to be poisonous.

Plumbaginaceae

(Plumbago Family)

Plumbagin.

146. **Plumbago indica** Linn. (-*P. zeylanica* Linn.) (Vern:-S.—Chitraka H. & B.-Chita, Bo.-Chitaro, M.-Chittira), *P. rosea* Linn. (Vern:—S.-Chitraka, H., B. & Bo.-Lal chitra, M.-Chittur-mol).

These are strong irritants externally and internally and are used to procure abortion.

Primulaceae

(Prime-rose Family)

Saponins.

147. **Anagallis arvensis** Linn. (Vern:—H.-Jonkhmari)

It produces gastro-enteritis in dogs and horses. It is used to poison fish and expel leeches from nostrils of animals.

148. **Cyclamen persicum** Miller. (Vern:--Ind. Baz.-Bankhur-i-Miryam).

It is believed to be a fish poison.

149. **Primula reticulata** Wall. (Vern:-Kumaon,—Bishcopra).

It is stated to be poisonous to cattle.

Myrsinaceae

(Ardisia Family)

Saponins.

150. **Maesa indica** Wall. (Vern:—M.-Kirithi) Leaves are stated to be fish poison.

Sapotaceae

(Sapodilla and mohwa Family)

Saponins.

151. **Madhuca indica** J. F. Gmel. *M.* (*Bassia*) *latifolia* (Roxb.) Macbride, *M. longifolia* (Linn.) Macbride.

The residual cake is used as fish poison and is said to have insecticidal properties. *Mohwa meal* is used to kill worms on lawns.

Ebenaceae

(Ebony Family)

Bitter substances.

152. **Diospyros ebenum** Koenig (Vern:—H. & Bo.-Tendu, M.-Acha), *D. montana* Roxb. (Vern:-S.--Tumala, H.-Lohari, B.-Ban-gal, Bo. Kundu, M.-Muchi-tanki), *D. paniculata* Dalz. (Vern:—S.-Thinduka, M.-Karinthuvari).

All these are believed to be fish poisons.

Salvadoraceae

(Salvadora Family)

153. **Salvadora oleoides** Dcne. (Vern:—H., S. & B.-Pilu, Bo.-Kankhina, M.-Ughaiputtai), *S. persica* Linn. (Vern:—S.-Pilu, H. & B.-Chota-pilu, Bo.-Pilvu, M.-Ughaiputtai).

The root bark is vesicant.

Apocynaceae

(Dog-bane and Oleander Family).

Kurchi and rauwolfia alkaloids; glucosides, e. g. cerberin, karabin, neriin, neriodorin, oleandrin, I-strophanthin, thevetin, etc.; bitter substances.

154. **Allamanda cathartica** Linn. (Vern :—Bo.-Jahari sontakka). It is a hydragogue cathartic.

155. **Cerbera manghas** Linn.(-*C. odollam* Gaertn.) (Vern.—B.-Dhakur, M.-Katarali).

The green fruit is used to poison dogs. The seeds are irritant poison and the plant is a fish poison.

156. **Ervatamia dichotoma** (Roxb.) Blatter (-*Tabernaemontana dichotoma* Roxb.)

The seeds are powerfully narcotic and poisonous.

157. **Holarrhena antidysenterica** Wall. (Vern:—S.-Kutaja, H.-Karchi, B.-Kurchi, Bo.-Pandhrakura, M.-Kashappu-vetpalarishi).

It is not browsed by cattle and goats; it is an anthelmintic, kurchicine is a general protoplasmic poison.

Lochnera pusilla K. Schum. (-*Vinca pusilla* Murr.), *L. rosea* (Linn.) Reichb. (-*Vinca rosea* Linn).

These are cardiac poisons and *L. pusilla* is regarded as poisonous to cattle.

159. **Melodinus monogynous** Roxb. (Vern:—B.-Sadul kou).
It is a fish poison.

160. **Nerium-indicum** Mill. (*N. odorum* Soland). (Vern:—S.-Karavi, H.-Karber, B.-Karabi, Bo.-Kanhera, M. Alari)

It is very poisonous and is used for suicidal purposes and to procure abortion; depresses nervous system and heart.

161. **Plumeria acuminata** Ait. (-*P. acutifolia* Poir.) (Vern:—S.-Kshira champa, H. & Bo.-Khair Champa, B.-Gobar champa, M.-Vadaganneru).

Its milk is rubefacient and is used to procure abortion; internally it acts as purgative and is poisonous.

162. **Rauwolfia serpentina** Benth. ex Kurz. (Vern:—S.-Sarpagandha, H.-Chota chand, B. & Bo.-Chandra, M.-Covannamilpori).

It is hypnotic and a fish poison.

163. **Thevetia peruviana** (Pers.) Merr. (-*T. neriifolia* Juss.) (Vern:—H. & Bo-Pila-kaner, B.-Kolkaphul, M.-Pachch-ai-alari).

All parts especially seeds are very poisonous. It is used to poison cattle and produces violent vomitting and purging. Action on heart like digitalis. It is also a fish poison.

Asclepiadaceae

(Milk-weed Family)

Tylopharine, glucosides, bitter substances, resins, saponins, etc.

164. **Asclepias curassavica** Linn. (Vern:—H.-Kakatundi, Bo-Karki).
It is a fish poison, emetic and cathartic.

165. **Calotropis gigantea** R. Br. (Vern:—S.-Arka, H.-Ak., B. & Bo.-Akanda, M.-Erukku), *C. procera* R. Br. (Vern:—S. Alarka, H.-Madar, P.-Shakar-al-lighal, Bo.-Mandara, M.-Vellerku).

Milk of these plants is drastic purgative and caustic. Stated to be used for suicidal and homicidal purposes and as an abortifacient and cattle poison.

166. **Cryptostegia grandiflora** R. Br. (Vern:—Bo.-Vilayati-vakhandi, M.-Palai).

A fatal case from leaves is reported in which persistent vomiting was observed.

167. **Cynanchum arnottianum** Wight., *C. vincetoxicum* Pers.

C. arnottianum is used as insecticide. *C. vincetoxicum* is not eaten by cattle and is regarded poisonous. Its root is emetic.

168. **Sarcostemma acidum** (Roxb.) Voigt (-*S. brevistigma* W. & A.) (Vern:—S. & Bo.-Soma, H. & B.-Somlata, M.-Kondapala).

Stated to have insecticidal properties.

169. **Secamone emetica** R. Br. (Vern:—B.-Shada-buri).

The roots are acrid and the plant is powerfully emetic.

170. **Tylophora indica** (Burm. f.) Merr. (-T. *asthmatica* Wight and Arn.), (Vern:-H. & B.-Antamul, Bo.-Anthamul, M.-Nay-palai), *T. fasiculata* Buch.-Ham. (Vern:-Bo.-Bhuidari).

Fatal cases are reported in man; it is emetic and *T. fasciculata* is used as rat poison.

Loganiaceae

(Nux-vomica Family)

Strychnine, brucine, etc.

171. **Strychnos colubrina** Linn. (Vern:—H. & B.-Kuchila-lata, Bo.-Goagarilakei, M.-Nagamusadi), *S. nuxvomica* Linn. (Vern:—S.-Visha-mushti, H.-Kuchla, B.-Kuchila, Bo.-Kajra, M.-Yetti).

These are poisonous. *S. nux-vomica* seeds are used as fish poison and are source of strychnine, one of the deadliest poisons known. Suicidal and homicidal cases are recorded. It is employed to kill dogs, rodent, etc.

Boraginaceae

(Borage and Sebestan Family)

Alkaloids.

172. **Heliotropium eichwaldii** Steud. (Vern:—H. & P.-Nilkattei, Kash.-Chirghas), *H. indicum* Linn. (Vern:—S.-Hastisunda, H. & B.-Hatisura, Bo.-Burundi, M.-Tel-kodukki).

These are suspected to be poisonous.

Convolvulaceae

(Convolvulin, pharbitin, terpithin, terpethein, cucutalin, resin.

173. **Calonyction muricatum** (Linn.) G. Don. (-*Ipomoea muricata* Jacq.)

See Ipomoea.

174. **Convolvulus arvensis** Linn. (Vern:—H.-Hiranpadi, Bo.-Hiranpag, M.-Naranji), *C. scammonia* Linn.

The roots are strongly purgative.

175. **Cuscuta reflexa** Roxb. (Vern:—S. Amaravela, H.-Akasbel, B.-Algusi, Bo.-Nirmuli, M.-Sitamapurgonalu).

It is nauseant and emetic; it is used to procure abortion.

176. **Ipomoea reptans** (Linn.) Poir. (-*I. aquatica* Forsk.) (Vern:—S.-Kalambi, B.-Kalmisak, Bo.-Nalichi baji, M.-Sarkarei-valli), *I. nil* Roth. (—*I. hederacea* Jacq.) (Vern:—H., B. & Bo.-Kaladana, M.-Jirkivirai), *I. purga* Heyne,

These are strongly purgative and irritant poisons in overdoses.

177. **Operculina turpethum** (Linn.) Manso (—*Ipomoea turpethum* R. Br.)

See Ipomoea

Solanaceae—

(Datura and nightshade Family)

Hyoscyamine, hyoscine, atropine.

178. **Atropa belladonna** Linn. (Vern:—H.-Sag-angur, B.-Yebruj, Bo.-Girbuti).

Fatal cases of poisoning are reported; dryness of mouth and throat, dilation of pupils and delirium characteristic features.

179. **Capsicum annuum** Linn. (Vern:—H. & P.-Mirch), *C. frutescens* Linn., *C. minimum* Roxb.

The seeds are gastro-intestinal irritant and are used for torturing purposes.

180. **Datura fastuosa** Linn. (Vern:—S.-Krishna dhatura, H. & B.-Kala Dhatura, M.-Karu umattai), *D. metel* Linn., *D. stramonium* Linn. (Vern:—B.-Sada dhutura, P.-Tattu dattura, M.-Umatai).

These are commonly used by criminals for stupefying their victims ; symptoms resemble those of Atropa.

181. **Hyoscyamus muticus** Linn., *H. niger* Linn. (Vern:—S.-Parasi-kaya, H.-Khurasani-ajvayan, B.-Khorasani ajowan, Bo.-Khora-sani-owa, M.-Khorasani-yomam), *H. pusillus* Linn , *H. reticulatus* Linn.

Cases of livestock and children poisoning are on record; action like Atropa.

182. **Lycium barbarum** Linn. (Vern:—Baluchi.-Koh-tor).

It is reported to be poisonous to livestock.

183. **Mandragora caulescens** Clarke.

It is suspected to be poisonous.

184. **Nicandra physaloides** Gærtn.

It is considered to be insecticide.

185. **Nicotiana rustica** Linn. (Vern:—H. & B.-Vilayeti tamaku, P.-Kakkar tamaku), *N. tabacum* Linn. (Vern:—H.-Tamaku, B.-Tamak., Bo.-Tambaku, M.-Pugai-ilai).

These are insecticide and are also used to ward off leeches fatal cases reported among human beings and livestock.

186. **Physochlaina praealta** Miers. (Vern:—P.-Nandru).

It is reported to be poisonous.

187. **Scopolia anomala** (Linn. et Otto) Airy-Shaw. (*S. lurida* Dunal).

It is poisonous and action is like Atropa.

188. **Solanum dulcamara** Linn. (Vern:—S. Kakmachi, P.-Ruba-barik) *S. incanum* Linn., (-*S coagulans* Forsk), *S. nigrum* Linn. (unripe berries) (Vern:—S. & B.-Kakmachi, H.-Makoi, Bo -Mako, M.-Manattak kali), *S. spirale* Roxb. (Vern.—H.-Mungas kajur, Bagua), *S. tuberosum* Linn. (Sprouting).

The cases of poisoning among human beings and animals are reported, some fatal. These are gastro-intestinal irritant; occasionally associated with atropa-like symptoms.

189. **Withania somnifera** Dunal. (Vern:—S., B. & Bo.-Ashwagandha; H.-Asgandh, M.-Amku-lang-kalang).

It is reported to be used as abortifacient and as an insecticide, it is also stated to be hypnotic.

Scrophulariaceae

(Mimulus and Digitalis Family)

Digitalin, digitonin, digitoxin, gitalin, gitonin, etc., saponin, bitter substance.

190. **Digitalis purpurea** Linn.

It is a cardiac poison and fatal cases due to eating of plant are reported in India

191. **Verbascum thapsus** Linn.

It is a fish poison and the seeds are narcotic.

Bignoniaceae

(Bignonia Family)

192. **Dolichandrone falcata** Seem. (Vern:-H.—Hawar, Bo.-Manchingi, M.-Kadatathie)

It is fish poison reputed to be abortifacient.

Pedaliaceae

(Sesamum Family)

Sesamol (a phenolic substance), seasmolin.

193. **Sesamum indicum** Linn. (-*S. orrientale* Linn.) (**Vern:—S., H., B.,** & Bo.-Til, M.-Yellucheddie.

Seed cakes are commonly fed to cattle in India but it is stated to be toxic to livestock in Europe producing colic, tremors, dyspnoea and distantion.

Verbenaceae

(Verbena and teak Family)

194. **Callicarpa longifolia** Lamk. var. *lanceolaria* **C. B. Clarke.**
It is a fish poison.

195. **Duranta repens** Linn. (*D. plumieri* Jacq.)

It is very bitter and believed to be poisonous to livestock, but generally refused.

196. **Lantana aculeata** Linn. (-*L. camara* Linn.) (Vern:-Bo.—Vhaneri, M.-Aripu)

The reports about being poisonous to livestock received from the Punjab and Assam Government Departments described it to be abortifacient.

196A **Stachytarpheta jamaicensis** (Linn.) Vahl. var. *indica* Lam. (-*S. indica* Vahl.)

It is described as abortifacient.

197. **Verbena officinalis** Linn. (Vern.—P.-Pamukh)

It is stated to be irritant poison.

Labiateae

(Mint and sage Family)

Essential oils, saponins.

198. **Eremostachys acanthocalyx** Boiss., *E. vicaryi* Benth (Vern:—P.-Gurgunna)

E. acanthocalyx is stated to be poisonous and *E. vicaryi* is used as a fish poison.

199. **Lamium amplexicaule** Linn.

It is regarded as injurious in America.

200. **Pogostemon heyneanus** Benth. (*P. patchouli* F.B.I., non Pelletier) (Vern:—H.-Pacholi)

The leaves are used as insecticide.

Chenopodiaceae

(Spinach and beet Family)

Essential oils, saponins, salsoline; oxalic acid.

201. **Chenopodium ambrosioides** Linn., *C. botrys* Linn

Anthelmintic against hook-worm and round worm. Fatal poisoning is on record.

202. **Haloxylon recurvum** Benge. ex Boiss., *H. salicornicum* Bunge ex Boiss.

These are stated to be poisonous but *H. recurvum* is a favourite food of camels.

203. **Salicornid brachiata** Roxb. (Oomarie keeray) Ash is stated to be abortifacient

204. **Salsola kali** Linn.

It is suspected to be poisonous but a feeding test with half dried plants in flowering stage was negative.

205. **Suaeda fruticosa** Forsk.

It is stated to be poisonous.

Phytolaccaceae

P hytolacca Family)

Bitter substances.

206. **Phytolacca latbenia** (Buch-Ham.) H. Walt. (*P. acinosa* Hook. f., B.I. non-Roxb.) (Vern:—H.-Matazor)

It is stated to be poisonous if eaten raw, but it is edible when cooked.

Polygonaceae

(Buck-wheat and rhubarb Family)

Rutin, essential oils, anthra-quinone derivatives, oxalic acid, oxalates.

207. **Fagopyrum esculentum** Moench, *F. tataricum* Gaertn.

It is commonly eaten but under certain conditions, not properly understood at present, produces eruptions and urticaria.

208. **Polygonum aviculare** Linn. (Vern:—S.-Nisomali, H.-Bannatia, B.-Machutie), *P. flaccidum* Meissn., *P. hydropiper* Linn. (B.-Packur-mul), *P. orientale* Linn., *P. persicaria* Linn., *P. tomentosum* Willd.

P. hydropiper is biting to a degree that no animal wil! eat it. Acrid, emetic, vesicant, insecticidal and piscicidal properties to varying degree are strongly suspected.

209. **Rheum emodi** Wall. (Vern:—H. & B.-Revandchini, Bo.-Ladakirevanda chini, M.-Nattu-ireval-chinni) and probably some other species.

Its leaves and petioles are edible but the latter is responsible for occasional poisoning.

210. **Rumex acetosa** Linn., *R. acetosella* Linn. (Vern: –S. Chutrika, B.-Chukapalam).

Oxalic acid poisoning is produced if eaten in excess.

Aristolochiaceae

(Birth-wort Family)

Aristolochin, glucoside, essential oils, bitter substance.

211. **Aristolochia bracteata** Retz. (Vern:—S.-Dhumrapatra, H.-Kirmar, M.-Adutina-palai), *A. indica* Linn. (Vern:—S.-Rudrajata, H. & B.-Isharmul).

These are nauseous and bitter, emmenagogue and abortifacient. *A. bracteata* is insecticide.

Piperaceae

(Pepper Family)

Essential oils, piperine, piperovatine.

212. **Piper sp.**

Harmful effects of *P. betle* Linn. and *P. nigrum* Linn. are well known.

Myristicaceae

(Nutmeg Family)

Essential oil (with myristicin), saponins.

213. **Myristica fragrans** Houtt., *M. malabarica* Lamk., (Vern:—Bo.-Ramphal), possibly some others also.

These are narcotic and occasional cases of poisoning are reported.

Lauraceae

(Laurel Family)

Essential oils.

214. **Cassytha filiformis** Linn.

It is stated to be used as insecticide.

215. **Cinnamomum camphora** F. Nees. (imported).

It is protective against moths; counterirritant, systemically stimulates then depresses and paralyses central nervous system.

Thymeliaceae

(Mezereum Family)

Saponins.

216. **Daphne cannabina** Wall., *D. oleoides* Schreb.

These are severe gastro-intestinal irritants. Camels do not eat *D. oleoides*.

217. **Edgeworthia gardneri** Meissn.

It is a fish poison.

218. **Lasiosiphon eriocephalus** Dcne.

Dust from dried plant very irritant and is not eaten by live-stock. It is a fish poison.

219. **Wikstroemia viridiflora** Meissn. (*W. indica* C. A. Mey, var. viridiflora Hook. f.)

It is a fish poison.

Loranthaceae

(Mistletoe Family)

220. **Viscucm album** Linn. and possibly others.

The poisonous properties are probably acquired if growing on poisonous hosts, e. g. *Strychnos nux-vomica.*

Euphorbiaceae

(Croton and eastor oil Family)

Cyanogenetic compounds, saponins, crotononside, ricinine, essential oils, euphorbon, phenolic substance, resins, toxalbumins.

221. **Andrachne cordifolia** Muell. Arg. (Vern:—P.Gurguli).

It is reported to be cattle poison and African species are used as insecticide.

222. **Baliospermum montanum** Muell., Arg. (-*B. axillare* Blume.) (Vern:—S., H., & B.-Danti, Bo.-Dantimul, M.-Naga-danti).

Its seeds and oil are drastic purgative and the seeds in overdoses are acro-narcotic poison.

223. **Buxus sempervirens** Linn. (Vern:—Kash.-Chikri, P.-Papri).

It is stated to be fatal to camels, cattle and goats are probably immune.

224. **Chrozophora rottleri** A. Juss. ex. Spreng. (-*C. tinctoria* Hook. f. in part). (Vern:—H.-Subali, P.-Kukronda).

It is emetic and cathartic and animals avoid it.

225. **Cleistanthus collinus** Benth. & Hook. f. (Vern:—M.-Nachuta).

It is used as fish poison and occasionally as human poison. An extract of it is a voilent gastro-intestinal irritant.

226. **Croton oblongifolius** Roxb., *C. tiglium* Linn. (Vern:—S.-Kanakaphala, H.-Jamalgota, B-Joypal, Bo.-Geyapal, M.-Nervalam.)

The seeds especially and the oil also is a drastic purgative and is reported to be poisonous. The seeds are stated to be used as insectide and piscicide.

227. **Euphorbia acaulis** Roxb., *E. antiquorum* Linn. (Vern :—S.-Vajrakantaka, H.-Tridhara-sehund, B.-Tekata sij, Bo.-Naraseja, M.-Shadhurakkalli), *E cattimandoo* W. Elliot, *E. helioscopia* Linn., *E. hirta* Linn., *E. hypericifolia*, Linn. (Vern:—Bo.-Nayeti, P.-Hazardana), *E. neriifolia* Linn. (Vern:—S.-Snuhi, H.-Sehund, B.-Mansa-sij, Bo.-Minguta, M.-Ilaikal, *E. nivulea* Buch. Ham., (S. patta karie, B.-Sij, Bo.-Newrang, M.-Aku-jemudu), *E. peplus* Linn. *E. pilosa* Linn., *E. rothiana* Spreng., *E. royleana* Boiss. (Vern: – H. & P.-Shakar pitan), *E. thomsoniana* Boiss., *E. thymifolia* Linn. (Vern:—S.-Racta-vinda-chada, H.-Chhoti dudhi, B.-Dudiya, Bo.-Nayeti, M.-Sittrapaladi), *E. tirucalli* Linn (Vern:—H.-Sehud, B.-Lankasij, Bo.-Shera, M.-Kombu-Kalli), *E. trigona* Haw.

Acrid and vesicant juice is found in most species and some are used as abortifacient when applied locally. *E. antiquorum*, *E. neriifolia*, *E royleana*, *E. tirucalli* are fish poisons and *E. antiquorum*, and *E. thymifolia* are stated to be used as insecticides, some are poisonous to livestock.

228. **Excoecaria agallocha** Linn. (Vern :—B.-Gangwa, B.-Geva, M.-Chilla).

Its fresh sap is extremely acrid and causes intolerable pain if it gets into the eye. The woodcutters have suffered and call it blinding tree. It is also fish poison.

229. **Fluggea leucopyrus** Willd., *F. virosa* Baill. (*F. microcarpa* Bl.) (Vern:—H.-Dalme, B.-Pandharphali).

It is a fish poison and is used to destroy worms in sores.

230. **Hura crepitans** Linn.

Its seeds and oil are violent purgative; milky juice very irritant.

231. **Jatropha curcas** Linn., *J. glandulifera* Roxb., *J. gossypiifolia* Linn., *J. multifida* Linn.

These are violent purgative like *Croton* sp. and *J. curcas* is a fish poison.

232. **Manihot esculenta** Crantz. (*M. utilissima* Pohl.) (Vern:—Baz.-Cassarva. M.-Maravuli

Its fresh tubers are extremely poisonous and cassava or tapioca meal is specially prepared.

233. **Phyllanthus urinaria** Linn. (Vern:—S.-Tamara valli, H. & B.-Hazarmani, M.-Shiyappunelli)

It is stated to be a fish poison.

234. **Ricinus communis** Linn. (Vern :—S.-Eranda, H.-Arand, B.-Verenda, Bo.-Erendi, M.-Amanakham chedi).

The seeds produce violent grastro-enteritis, subcutaneously very poisonous. The oil is stated to be an active poison for flies.

Plant is a fish poison.

235. **Sapium indicum** Willd. (Vern:—B.-Hurua, Bo.-Hurna), *S.-insigne* Trimen. (Vern:—H.-Khinna, Bo.-Dudla).

S. indicum juice is narcotic poison. The fruit is extremely nauseous and seeds are fish poison. *S. insigne* juice is vesicant.

236. **Tragia bicolor** Miq., *T. involucrata* Linn. (with varieties) (Vern:—S.-Vrischikali, H.-Barhanta, B.-Bichuti, Bo.-Kanchkuri, M.-Kanchuri-vayr.).

These are stinging nettles.

Urticaceae

(Nettle, hemp and mulberry Family)

α-β & γ-antiarin, saponin, resin containing cannabindol (toxic), formic acid.

237. **Antiaris toxicaria** Lesch. O. (Vern:—Bo.-Chandla, M.- Nettavil, Sing.-Riti, Burma -Hmyaseik).

Its sap is used as an arrow poison, it is a powerful heart poison.

238. **Cannabis sativa** Linn. (Vern:—S.-Ganjika, H., B. & Bo-Ganja, M.-Bhangi).

The preparations of bhang, charas and ganja are well known in India; excessive indulgence produces physical and mental injury. Stated to be used as a fish poison in Bengal. It is spread on beds to drive away bugs.

239. **Ficus sp**.

Some species contain acrid juice; according to Watt fruit of *F. bengalensis* is poisonous to horses.

240. **Fleurya interrypta** Gaud.

Stings.

241. **Girardinia leschenaultiana** Dcne., *G. zeylanica* Dcne.

These are stinging nettles.

242. **Laportea crenulata** Gaud., *L. terminalis* Wight.

These are stinging nettles.

243. **Urtica dioica** Linn., (Vern:—H. & P.-Bichu), *U. hyperborea* Jacq., *U. parviflora* Roxb., *U. pilulifera* Linn.

These are stinging nettles.

Juglandaceae
(Walnut Family)

244. **Juglans regia** Linn. (Vern:—S.-Akshota, H. & B.-Akhroot, Bo.-Akroda, M.-Akrottu).

The rind of unripe fruit is stated to be fish poison in Jaunsar and Tehri Garhwal.

Myricaceae
(Sweet-gale Family)

Essential oils, myricelin).

245. **Myrica nagi** Thunb. (Vern:—S.-Katphala, H., B. & Bo.-Kaiphal, M.-Marudam-pattai).

Bark is stated to be used as fish poison in Khasia hills.

Gnetaceae
(Gnetum Family)

Saponins, bitter substance.

246. **Gnetum scandens** Roxb.

It is a fish poison.

Conifereae
(Pine Family)

Essential oils, taxine, taxicatin.

247. Several members especially *Taxus baccata* Linn.

Most members possess toxic essential oils and poisoning due to the use of Juniper oil as abortifacient is reported. Deaths in man and animals due to eating the berries and leaves of *T. baccata* are reported and the seeds are very poisonous.

Iridaceae
(Iris Family).

Saponins, picrocrin (bitter substance), essential oils.

248. **Crocus sativus** Linn. (Vern:—S.-Kumkuma. H., B. & Bo.-Jafran, M.-Kungumapu).

Bulbs are toxic to young animals and stigmas in overdoses are narcotic poison. It is used as abortifacient.

Amaryllidaceae

(Amaryllis and Agave Family)

Saponin, Lycorine, tazetitne.

249. **Agave americana** Linn. (Vern:—H -Kantala, B.-Jungli anarash).

It is stated as fish poison and it is also stated to be toxic to livestock under field conditions. The wall paper impregnated with expressed juice is said to be proof against white-ants.

250. **Cirnum asiaticum** Linn. Vern:—S.-Vishamandala, H. Pindar B.-Bara-kanur, Bo.-Nagdowan, M.-Vishomangil), *C. lotifolium* Linn. (Vern:—H. & B.-Sukh-darsan).

251. **Narcissus tazetta** Linn. (Vern:—P. Nargis).

Its bulbous roots are emetic and purgative, and produce irritant poisoning in overdoses.

Taccaceae

252. **Tacca pinnatifida** Forst. (Vern:—Bo.-Diva, M.-Karachunai).

The tuber is intensely bitter, acrid and poisonous when fresh; yields nutritious starch by maceration and repeated washing.

Bromeliaceae

(Pine-apple Family)

253. **Ananas comosus** Merr. (--*A. sativus* Schult.) (Vern:—H.-Anannas, B.-Anaras, M -Anasha pazham).

The juice of leaves and unripe fruit is purgative and is sometimes used as abortifacient.

Dioscoreaceae

(Yam Family)

Dioscorine, glucoside (toxic).

254. **Dioscorea bulbifera** Linn. *D. hispida* Dennst, (—*D. daemona* Roxb.), *D. prazeri* Prain & Burk (—*D. deltoidea* Wall.).

Tubers are very acrid but in most cases boiling makes them edible.

Liliaceae

(Lily Family)

Imperialine, colchicine, methyl-colchicine, saponine, borbaloin emodin, sicaloin, resin, essential oils, etc.

255. **Allium sativum** Linn. (Vern:—S.-Lasuna, H. & Bo.-Lasan, B.-Rasun, M.-Vallaipundu).

Its essential oil is very irritant and pungent; produces irritant poisoning in excess. It is also stimulant, narcotic and anthelmintic.

256. **Aloe species.**

Insipisated juice 'Mushabbar' of commerce is a powerful drastic purgative and fatal cases are reported from its use. It has been used to procure abortion.

257. **Colchicum luteum** Baker. (Vern:—Surinjan).

Resembles closely the foreign *C. autumnale* which is poisonous and produces gastro-intestinal irritation. The Indian species is also poisonous.

258. **Fritillaria imperialis** Linn.

The bulbs are toxic when fresh and are said to act as heart poison.

259. **Gloriosa superba** Linn. (Vern:—S.-Sukra puspita, H.-Kalihari, B -Bishlanguli, Bo.-Karianag, M.-Agnisikha).

The root is stated to be sometimes used for suicidal purposes and as abortifacient; it is an acronarcotic poison. The juice of leaves is stated to be used to destroy lice in hair.

260. **Scilla iddica** Baker.

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261. **Urginia coromandeliana** Hook. f., *U. indica* Kunth. (Vern:—S.-Vana-palandam, H. & B.-Jangli piyaz, Bo.-Jangli-kanda, M.-Nari-vengayam).

The bulbs are irritant poison. The foreign species *U. scilla* is a fish poison, as also is the Indian representative.

Juncaceae
(Rush Family)

262. **Juncus effusus** Linn.

It is suspected to be poisonous to livestock in South Africa. This and other species in India are worth investigating.

Palmaceae
(Palm Family)

Arecaine, arecolidine, arecoline, guvacine, guvacoline, saponins.

263. **Areca catechu** Linn. (Vern:—S.-Gubak, H. & B.-Supari, Bo.-Sopari, M. Kamugu).

Young and undried nut when chewed in excess gives rise to temporary giddiness. It also produces gripping and strong intestinal irritation, resulting in loose motions.

264. **Arenga obtusifolia** Mart.

Juice from fruit is used in Malaya to poison enemies and *A. obtusifolia* is stated to be used as fish poison.

265. **Corypha umbraculifera** Linn. (Vern:—S.-Alpayushi, M.-Talipanai).

The fruit is stated to be used as fish poison.

266. **Wallichia disticha** T. Anders.

Watt states that berries and perhaps the leaves are irritant to skin.

Araceae
(Aroid Family)

Calcium oxalate (acicular crystals), bitter substance, sharp acrid substance, essential oil (alkaloid and saponin in foreign plant).

267. **Acorus calamus** Linn. (Vern:—H. & B.-Bach, Bo.-Vaj, M.-Vashambu), *A. gramineus* Soland.

Roots are stated to be used as effective isecticides and insectifuge. Doubtful case reported when *A. calamus* proved poisonous to camels during the Afghan Campaign. The rhizome is used in medicine but in overdoses produces violent and persistent emesis.

268. **Alocasia indica** Schott. (Vern:—S.-Manaka, H.-Mankenda, B.-Mankachu), *A montana* Schott., *A. odora* (Roxb.) C. Koch (-*A. macrorhiza* Schott.)

Fresh tubers are acrid and irritant.

269. **Amorphonphallus campanulatus** (Roxb.) Bl. *A. lyratus* Engl., *A. sylvaticus* (Roxb.) Kunth (*Sunantherias sylvatica* Schott.)

Fresh tubers are acrid and irritant and the seeds are intensely acrid. Seeds of *A. sylvaticus*, like *Plesmonium*, and fruit are intensely acrid.

270. **Arisaema speciosum** Mart. (Vern :—P.-Kiralu), *A. tortuosum* Schott. (Vern:—P.-Samp-ki-kumb).

The tubers are poisonous and have insecticidal properties. The fruit is also probably poisonous.

271. **Homalomena rubescens** Kunth.

It is stated to be poisonous.

272. **Lagenandra ovata** (Linn.) Thw. (-*L. toxicaria* Dalz) (Vern:—Bo.-Rukh-alu, M.-Maravara Tsjembu)

It is stated to be very poisonous and has insecticidal properties.

273. **Plesmonium margaritiferum** Schott.

Its crushed seeds produce local anaesthesia and it is used as a cure for toothache.

274. **Sauromatum guttatum** Schott.

Tubers are regarded as very poisonous.

275. **Steudnera virosa** (Kunth) Prain (-*Colocasia virosa* Kunth.).

It is believed to be poisonous.

276. **Thomsonia nepalensis** Wall.

It is acrid when fresh.

277. **Typhonium trilobatum** Linn. Schott. (Vern:—B.-Ghet-kachu, M.-Karunaikkizhangu).

Fresh tubers are exceedingly acrid.

Cyperaceae
(Sedge Family)

Essential oil.

278. **Carex cernua** Boott.

It is said to be one of the causes of 'vlei' poisoning in cattle in South Africa.

279. **Cyperus longus** Linn.

It is regarded as poisonous in South Africa.

280. **Scirpus corymbosus** Heyne.

See *Carex cernua*.

Gramineae
(Grass Family)

Cyanogenetic glucosides, hydrocyanic acid, temuline, saponins, oxalic acid, selenium protein (toxic).

281. **Avena fatua** Linn. (Vern:—H.-Kuljud), *A. sativa* Linn.

It is good fodder but occasionally deleterious probably on account of 'hair balls' that are developed in the stomach.

282. **Bambusa bambos** Druce (-*B. arundinacea* Willd.) (Vern:—S.-Vansa, B. & H.-Bans, Bo.-Mandgay, M.-Mangal).

Fresh young shoots are stated to have insecticidal properties.

283. **Dendrocalamus strictus** (Roxb.) Nees. (Vern:—H.-Bans kaban, B.-Karail, Bo.-Bas, M.-Kanka).

The leaves are stated to be used to procure abortion.

284. **Lolium perenne** Linn., *L. temulentum* Linn. (H.-Machni).

Several cases of poisoning, mostly non-fatal in man and animals, from eating the seeds of *L. temulentum* have been recorded. Gastro-intestinal irritation and severe nervous symptoms are reported.

285. **Panicum maximum** Jacq.

It is suspected to be responsible for the production of 'Dikoor', a disease affecting young sheep in Africa.

286. **Paspalum scrobiculatum** Linn. (Vern:—S.-Kodrava, H.-Kodo, B.-Kodoa, dhan, Bo.-Kodra, M.-Kiraruga).

The 'kodra' poisoning is very similar to *L. temulentum* poisoning; the animals suffer much more than men. The animals should be prevented from grazing the crop when ripening.

287. **Sorghum halepense** (Linn.) Pers. (Vern:—H.-Baru, B.-Kalamucha), *S. saccharatum* Pers. (Vern:—H. & Bo.-Deo-dhan, M.-Tellajonna), *S. vulgare*. Pers. (Vern:—S. Javanala, H., B. & Bo.-Jowar, M.-Cholam).

These are good fodder but occasional poisoning is reported with stunted growth, under drought conditions. The frosted leaves, or second growth is dangerous.

288. **Stipa sp.** (some).

It is believed to be poisonous and mechanical action of 'seeds' may not be overlooked.

289. **Triticum aestivum** Linn. (Vern:—S.-Godhum, H.-Gehun, Bo.-Gam, M.-Godumai).

Under certain conditions it becomes deleterious fodder.

290. **Zea mays** Linn. (Vern:—S.-Yavanala, H. & B.-Bhutta, Bo.-Makai, M.-Makka-scholam).

The pollen from it is stated to be a possible cause of hay fever. It is said to be occasionally responsible for deleterious effects, as yet not fully understood.

CHAPTER IX

We have studied the literature on Indigenous Systems of Medicine as practiced in India with a view to find out the uses to which different medicinal plants have been put in the treatment of various important diseases. For instance certain plants have the reputation of being effective in the treatment of bowel diseases particularly dysentery and cholera. Others are said to be useful in the treatment of prolonged fevers such as the group of enteric fever. Certain other plants are alleged to be effective in the treatment of tuberculosis (pulmonary). Yet another group is considered to have action on genital organs and emenagogue and abortifacient properties are attributed to them. Investigation on some of these plants has been carried out and brief summaries of the results achieved are given. Others marked with an asterisk have not been investigated so far and will form a field for research for the investigators.

Besides these certain plants are considered to have insecticidal and insect-repellent properties and another allied group is toxic to fishes. These, as has been already indicated, are a very important group from point of view of control of insect and other pests which do incalculable harm to man, livestock and agricultural crops.

The object of giving these lists is to bring these to the notice of those who are interested in indigenous drugs. To the lay public these will be of general interest, as they will find many names of common plants growing at their very door which have been considered effective in the treatment of common ailments and are household remedies. For the research worker these lists will open up a field for investigation and will give an idea as to the avenues in which investigations might be directed.

Indian Medicinal Plants Alleged to be useful in Tuberculosis in the Indian Indigenous Medicine.

1. ABRUS PRECATORIUS Linn.
2. ADHATODA VASICA Nees.
3. AEGLE MARMELOS Corr.
4. ALANGIUM SALVIIFOLIUM (Linn.) Wang. Syn.-*A. lamarckii* Thwaites.

*5. ALBIZZIA JULIBRISSIN Durazz. ; (B.-Kalkora, H.-Lal siris) ; outer Himalaya from the Indus to Sikkim, ascending upto 6,000 to 7,000 ft.

*6. ALBIZZIA LEBBECK Benth. ; (S.-Shirisha, H., B. & Bo.-Siris) ; throughout India, ascends to 4,000 ft. in the Himalayas usually planted.

*7. ALLIUM CEPA Linn. ; (S.-Palandu, H.-Piyaz, B.-Piyaj, Bo.-Kanda); extensively cultivated all over India.

8. ALLIUM SATIVUM Linn.

*9. ALLIUM SCHOENOPRASUM Linn.; Kashmir to Kumaon 8,000 ft. to 11,000 ft., grown as a garden crop.

10. ALPINIA GALANGA Swartz.

11. ASCLEPIAS CURASSAVICA Linn.

*12. ASPARAGUS RACEMOSUS Willd.; (S. & B.-Shatamuli, H.-Shatawar, Bo.-Satavari): Himalayas, from Kashmir eastwards.

13. AZADIRACHTA INDICA A. Juss., Syn. *Melia azadirachta* Linn.

*14. BAUHINIA RACEMOSA Lam.; (S.-Svetakanchan, H.-Kanchnal); throughout India.

*15. BAUHINIA VARIEGATA Linn.; (S.-Kovidara, H.-Kachnar, B.-Rakta kanchan); sub-Himalayan tract from Indus eastwards, dry forest of Eastern, Central & South India.

16. BUTEA MONOSPERMA (Lam.) Kuntze.

*17. CANSCORA DECUSSATA Schult.; (S.-Sankhapuspi, H.-Sankhaphuli); throughout India upto 4,000 ft., grows in moist situations.

*18. CAPPARIS SPINOSA Linn.; (S.-Kakadani, H. & P.-Kabra); plains between the Indus & Jhelum, Salt Range, Chamba, Kumaon, Nepal, Deccan, W. Ghats, Baluchistan, Wazirstan.

19. CASSIA FISTULA Linn.

*20. CASSIA TORA Linn. Syn.-*C. obtusifolia* Linn.; (S.-Chakramards, H. & Bo.-Chakunda); throughout India.

*21. CHIONACHNE KOENIGII (Spreng) Thw. *Polytoca barbata* ;Stapf. (B.-Gurgur, H.-Kansa, S.-Kanda); throughout India in hot and damp parts.

22. CIMICIFUGA FOETIDA Linn.; (P.-Jiunti).

23. CITRULLUS COLOCYNTHIS Schrad.

*24. CLERODENDRON SERRATUM (Linn.) Moon.; (H.-Barnagi, S. & Bo.-Bharangi); more or less throughout India.

25. CLITORIA TERNATEA Linn.

26. COCCINIA CORDIFOLIA Cogn. Syn.-*C. indica* W. & A., *Cephalandra indica* Naud.

*27. COCCULUS HIRSUTUS Diels.; (B.-Hayer, Bo.-Vasanvel, H.-Jamti-ki-bel); from the foot of the Himalayas to S. India.

*28. COCOS NUCIFERA Linn.; (H.-Nariyal, Bo.-Narel, M.-Tanba); cultivated in the hot damp regions of India especially near the sea.

*29. COMMIPHORA AGALLOCHA Engler. (B., Bo. & H.-Guggul); Assam, Sylhet, Bengal, Madhya Pradesh.

30. COMMIPHORA MUKUL Engl.; Syn.-*Balsamodendron mukul* Hook. ex Stock; Bellary, Mysore, Khandesh, Kathiawar, Rajasthan, Sind, Baluchistan.

*31. CORIANDRUM SATIVUM Linn.; (S..-Dhanyaka, H. & B.-Dhania); extensively cultivated throughout India.

*32. CRATAEVA NURVALA Ham.; (H.-Barun, S.-Varuna) almost all over India, wild or cultivated, often found along streams.

*33. CRESSA CRETICA Linn.; (H. & B.-Rudranti, Bo.-Khardi); throughout India.

*34. CUMINUM CYMINUM Linn.; (S. Jiraka, H.-Jira, Zira, Tam.-Shiragam); cultivated throughout India (except Bengal & Assam),

*35. CURCUMA ANGUSTIFOLIA Roxb.; (H. & B -Tikhur, Tam.-Kua); outer ranges of Central Himalayas, Bihar, Bengal.

*36. CURCUMA ZEDOARIA Bose.

*37. DIOSPYROS MELANOXYLON Roxb.; (H.-Kendu, B. Kend, Bo.-Temru); deciduous forests of the Madhya Pradesh, Bihar, W. Peninsula, Chota Nagpur.

38. DRYNARIA QUERCIFOLIA J. Sm.

39. ELETTARIA CARDAMOMUM Maton.

*40. EMBELIA TSJERIAM-COTTAM A. Dc. (H.-Bayabirang, Bo.-Barbatti)! Ceylon, Malabar Coast, Sylhet and Assam.

*41. EULOPHIA NUDA Lindl ; (S.-Manya, H.-Goruma, H.-Badbar). Tropical Himalaya, Nepal to Sikkim, Assam, Khasia Hills, Chota, Nagpur, Manipur, W. Peninsula.

*42. FRITILLARIA CIRRHOSA Don. Prodr.; Central & E. Himalayas, Sikkim, 11,000 to 16,000 ft.

*43. FRITILLARIA ROYLEI Hook.; Kashmir to Kumaon, 8,000 to 13,000 ft.

*44. GERANIUM ROBERTIANUM Linn.; Kashmir to Garhwal.

45. GLYCYRRHIZA GLABRA Linn.

*46. GMELINA ARBOREA Linn.; (S.-Gumbhari, H.-Kambari); throughout India.

*47. GOSSYPIUM ARBOREUM Linn.; (H.-Nurma, P.-Papas); Indian gardens.

*48. GRAPTOPHYLLUM PICTUM (L.) Griff.; (M.-Ysjudemaram); Indian gardens.

*49. GREWIA ASIATICA Linn. (S.-Parusha, H. & B.-Phalsa) ; extensively cultivated throughout India.

*50. HAUCLEA SESSILIFOLIA Roxb.

*51. HYSSOPUS OFFICINALIS Linn.; (Zufah-Yabis); Kashmir to Kumaon, 9,000 to 11,000 ft.

*52. INDIGOFERA TINCTORIA Linn. ; (S.-Nilika, H. & Bo.-Nil) ; widely cultivated in many parts of India.

*53. JASMINUM AURICULATUM Vahl. ; (S. & Tel. ; Magadhi) ; Deccan, Carnatic, W. Peninsula.

*54 LACTUCA SERRIOLA Linn. Syn. *L. scariola* Linn. (H.-Kahoo, B.-Salad); W. Himalaya, 6,000-12,000 ft.

*55. LEEA AEQUATA Linn.; (S., H. & B.-Kakajangha); Sikkim, Himalaya, Assam, East Bengal, Sylhet, Andamans.

56. LINUM USITATISSIMUM Linn.

*57. LITSEA CHINENSIS Lam. (H.-Garbijaur, B.-Kukarchita); throughout the hotter parts of India.

*58. LORANTHUS ASPER Lour.

59. LUFFA ACUTANGULA var. *amara* Clarke.

60. LUFFA ECHINATA Roxb. Host. Beng.

61. LUVUNGA SCANDENS Ham.

*62. MACHILUS MACRANTHA Nees. ; (Tam.-Kolamavu, Mal.-Uravu) ; W. Peninsula.

*63. MARTYNIA ANNUA Linn. ; (H.-Bichu, B.-Baghnoki, Tel.-Garudamukku) ; naturalized in India.

*64. MELISSA PARVIFLORA Benth.; (H.-Bililotan); Garhwal to Sikkim & Mishmi, Khasia hills.

*65. MIMUSOPS HEXANDRA Roxb. ; (S.-Rajadani, H.-Khirni, M.-Palla) ; upper Gangetic plain, Madhya Bharat, S. India.

*66. MOMORDICA DIOICA Roxb. ; (S.-Vahisa, M.-Palupaghel kalung) ; throughout India, ascending to 5,000 ft. in Himalayas.

67. MORINGA OLEIFERA Lam.

68. MUSA SAPIENTUM O. Kuntze.

*69. OCHNA PUMILA Ham. ex. D. Don.; (Santh.-Champabaha); Kumaon to Sikkim, Bihar, Chota Nagpur.

*70. OLDENLANDIA UMBELLATA Linn. ; (M.-Saya, H.-Chirval) ; Orissa, Bengal, Deccan, Circars, Carnatic.

71. OPERUCLINA TURPETHUM (Linn.) Silva Manso.

*72. PHASEOLUS ACONITIFOLIUS Jacq. (H.-Mat, Tam.-Tulkapyre); Himalayas to Ceylon.

*73. PHASEOLUS TRILOBUS Art. ; (H. & B.-Mugani) ; Himalayas to Ceylon and Burma.

*74. PIPER CHABA Hunter (H. B. & Bo.-Pan) ; cultivated in various parts of India.

*75. PIPER LONGUM Linn.; (S.-Pippali, H.-Pipal); hotter states of India.

76. PINUS ROXBURGHII Sargent, Syn.-*P. longifolia* Roxb.

77. PISTACIA INTEGERRIMA Stew.

*78. PISTIA STRATIOTES Linn.; (H.-Jalqumbhi, Bo.-Prashni); throughout India in still sweet waters.

*79. PLANTAGO MAJOR Linn.; (H.-Lahuriya, Bo. Bartang); Assam, Khasia hills, W. Ghats, Konkan, Nilgiris, Pulneys, Baluchistan.

80. PLUMBAGO ZEYLANICA Linn.

*81. RHODODENDRON CAMPANULATUM Wall. ex. G. Don.; (H.-Cherailu, Kash.-Gaggar); alpine regions from Kashmir to Bhutan.

82. RHUS SUCCEDANEA Linn.

*83. SANSEVIERIA ROXBURGHIANA Schult.; (B.-Murba, Bo.-Morwa); Coromandel coast.

*84. SANTALOIDES MINUS Schellenb. Syn.-*Rourea santaloides* W. & A.; (B.-Vitaraka, Bo.-Vardara); Konkan, S. M. Country, Kanara to Travancore.

*85. SAPINDUS TRIFOLIATUS Linn. (S.-Phemila. H., B. & Bo.-Ritha).

*86. SESBANIA SESBAN (Linn). Merr. Syn.-*S. aegyptiaca* Pers.; (H. & B.-Jayanti); plains from the Himalayas to Ceylon, ascending upto 4,000 ft. in north-west.

87. SIDA CORDIFOLIA Linn.

88. SIDA RHOMBIFOLIA Linn.

*89. SOLANUM TRILOBATUM Linn.; (S.-Alarka, M.-Tudovullay); Gujerat, Deccan, S. M. Country, N. Circars, Carnatic.

*90. SPHAERANTHUS INDICUS Linn.; (S.-Munditika, H. & Bo.-Gorakmundi); throughout India, ascending the Himalayas upto 5,000 ft. from Kumaon to Sikkim.

*91. SPONDIAS PINNATA Kurz.; (S.-Amrataka, H., B. & Bo.-Amra); from the Chenab eastwards, Salt Range, Andamans, W. Indian Peninsula.

92. STEPHANIA GLABRA Roxb.

*93. STREBLUS ASPER Lour.; (H.-Siora, B.-Sheora); drier parts of India, Travancore, Andamans.

*94. TERAMNUS LABIALIS Spreng.; (S.-Masha-Parui, H.-Mashparui); throughout India.

*95. URTICA DIOICA Linn.; (H. & P.-Bichu); N. W. Himalaya, from Kashmir and the Salt Range to Simla, 8,000-10,700 ft.

*96. VANDA SPATHULATA Spreng.; (Mal.-Ponnam-penmaraiva); W. Peninsula, from Malabar to Travancore.

*97. VATERIA INDICA Linn.; (S.-Ajakarua, H.-Safed damar); Western India, from N. Kanara to Travancore, chiefly in evergreen forests, Coorg.

98. VERBASCUM THAPSUS Linn.

*99. VERNONIA CINEREA Less.; (S. & H.-Sahadevi, B.-Kukseem); throughout India, ascending to 8,000 ft. in the Himalaya Khasia and Peninsula mountains.

*100. VERNONIA ROXBURGHII Less; Upper Gangetic Plain, Kumaon, Bengal, Central & W. India.

101. WITHANIA SOMNIFERA Dunal.

*102. ZIZYPHUS JUJUBA Lam.; (S.-Badari, H.-Baer, B.-Kul); indigenous and naturalized throughout India, in the Outer Himalaya upto 4,500 ft.

Indian Plants Considered to be useful in Dysentery in Indian Indigenous Medicine.

1. ABRUS PRECATORIUS Linn.

*2. ABUTILON INDICUM Sw.; (H.-Kanghi, B.-Potari); throughout the hotter parts of India.

*3. ABUTILON THEOPHARSTIC Medic; (S.-Jaya, Bo.-Nahani khapat); N. W. India, Sind, Kashmir, Bengal.

*4. ACACIA ARABICA Willd.; (H.-Kikar, B.-Babla); naturalized in all parts of India, indigenous to Sind and the Deccan.

*5. ACACIA CATECHU Willd.; (H.-Khadira, H.-Khair); Punjab, N. W. Himalaya, Central India, Bihar, Ganjan, Konkan, Deccan.

*6. ACACIA FERRUGINEA DC.; (Nep.-Khour, Bo.-Ker); Gujerat, Berar, Circars, Deccan, Konkan, Carnatic, W. Ghats.

7. ACORUS CALAMUS Linn.

*8. ADENSONIA DIGITATA Linn.; (H. & Bo.-Gorakh-amli;); occasionally cultivated in some parts of Uttar Pradesh, Bihar, Bombay & Madras.

9. ADHATODA VASICA Nees.

*10. ADIANTUM LUNULATUM Burm.; (H. & B.-Kali-Jhant, Bo.-Hansraj); throughout N. India in moist places, South India.

11. ADINA CORDIFOLIA Benth.

12. AEGLE MARMELOS Corr.

*13. AGARICUS OSTREATUS (Jacq.) Fries.; (Bo.-Phanasa-alambe).

*14. AGERATUM CONYZOIDES Linn.; (B.-Dochunty; Bo.-Osari); throughout India upto 5,000 ft.

15. AILANTHUS ALTISSIMA (Mill.) Swingle, Syn.—*A. glandulosa* Desf.; (English-Ailanto).

*16. AILANTHUS EXCELSA Roxb.; (H.-Mahanimb, Tam.-Peruppi); Bihar, Chota Nagpur, Madhya Pradesh, Ganjam, Vizagapatnam, Deccan.

*17. AILANTHUS MALABARICA DC.; (Bo.-Guggula-dhup. Tel.-Maddi-palu); Konkan, Deccan, W. Ghats.

18. ALBIZZIA LEBBECK Benth.

19. ALSTONIA SCHOLARIS R. Br.

*20. ALTHAEA ROSEA Cav.; Indian Gardens.

*21. AMARANTHUS TRICOLOR Linn. Syn.—*A. gangeticus* Linn.; (H.-Lal-sag, S.-Marisha); cultivated throughout India.

*22. AMOMUM XANTHIOIDES Wall.; (H.-Ilayechi, Tam.-Elam); Tavoy, Tenasserim.

23. ANDROGRAPHIS PANICULATA Nees; (S.—Bhunimba, H.-Kiryat).

*24. ANNONA MURICATA Linn.; (S.-Mullanjakka, Tam.-Mullu-chitta); grown to a small extent in Assam.

25. ANNONA RETICULATA Linn.

*26. ANTHOCEPHALUS INDICUS A. Rich. Syn.-*A. cadamba* Miq. S. & H.-Kadamba); sub-Himalayan tract from Nepal to Burma, Circars and W. Ghats.

27. ANTIARIS TOXICARIA Leschen.

*28. ASPARAGUS ADSCENDENS Roxb.; (H.-Safed musli, Gharwal-Jhirna); Punjab & the Himalayas upto 5,300 ft.

29. ASPARAGUS RACEMOSUS Willd.

*30. ASTERACANTHA LONGIFOLIA Nees.; (H.-Tal-makhana, S.-Kakilakshya) throughout India in moist places.

*31. AVERRHOA CARAMBOLA Linn.; (H.-Karmal, M.-Tamarta); gardens in hotter parts of India as far north as Lahore.

32. BALANITES AEGYPTIACA Del. Syn.-*B. roxburghii* Planch.

*33. BARRINGTONIA ACUTANGULA (Linn.) Gaertn. (B.-Hijal, H.-Hijjal); common in the sub-Himalayan tracts east of the Madhya Pradesh, Jumna, Bihar, Orissa, Bengal, Assam, S. India.

*34. BASELLA RUBRA Linn.; (S.-Potaki, H. Lalbachlu); throughout India, wild & cultivated.

35. BAUHINIA RACEMOSA Lam.

*36. BAUHINIA TOMENTOSA Linn.; (S.-Aswamantaka, H.-Kachnar, Bo.-Asundro, M.-Kanchnine); N. W. States, Circars, Carnatic, often cultivated in other parts of India.

37. BAUHINIA VARIEGATA Linn.

*38. BERGENIA LIGULATA (Wall.) Engl. (B.-Patharchuri, Bo. Pashanbheda); temperate Himalayas, from Kashmir to Bhutan, between 7,000-10,000 ft. Khasia hills.

*39. BIDENS TRIPARTITA Linn.; Central & W. Himalaya from Nepal to Kashmir, W. Tibet.

*40. BOSWELLIA SERRATA Roxb.; (S.-Shallaki, H. & B.-Luban); Madhya Pradesh, Deccan, Bihar, Orissa, Rajasthan, Madhya Bharat, Gujerat.

*41. BOTRYCHIUM LUNARIA Sew.; (English-Moonwort); common from Kashmir to Sikkim ascending upto 13,000 ft.; extending to Korakaram Range.

42. BRASSICA CERNUA (Thunb.) Forbes & Hemsley.

43. BRUCEA AMARISSIMA (Lour.) Merr. Syn.-*B. sumatrana* Roxb.

44. BUTEA MONOSPERMA O. Kuntze.

*45. CAESALPINIA JAYABO Maza; (Arab.-Bunduk, Tam.-Kalarislkkodi); Indian Peninsular region.

*46. CALAMUS ROTANG Linn.; (S.-Vetasa, H., B. & Bo.-Bet); Madhya Pradesh, Deccan, Carnatic.

47. CALOTROPIS GIGANTEA R. Br.

48. CARAPA MOLUCEENSIS Lam.

49. CARUM BULBOCASTANUM Koch. (H.-Kalajira, Kash.-Guniyan); Kashmir, Baluchistan.

50. CARUM CARVI Linn.

*51. CASSIA AURICULATA Linn.; (H. & B.-Taruar, Tam.-Avaram); wild in the dry regions of Madhya Pradesh, W. Indian Peninsula, Rajasthan, cultivated in other parts of India.

52. CASSIA FISTULA Linn.

53. CASSIA TORA Linn.

54. CASSYTHA FILIFORMIS Linn.

*55. CASUARINA EQUISETIFOLIA Linn.; (H.-Janglisaru, B.-Belatijau); from Chittagong Southwards.

56. CEDRELA TOONA Roxb.

*57. CELSIA COROMANDELIANA Vahl. (S.-Kulahala, Bo.-Kolhal); throughout India.

58. CENTELLA ASIATICA (Linn.) Urban Syn.—*Hydrocotyle asiatica* Linn.

*59. CEROPEGIA TUBEROSA Roxb.; (P.-Galot, Bo.-Khappar kadu, M.-Manda); Konkan, Deccan, S. M. Country. Circars.

*60. CINNAMOMUM INERS Reinw.; (Bo.-Tikhi, H.-Jangli darchini); evergreen forests of W. Ghats, Carnatic, Sheoroy & Kollimalai.

61. CLITORIA TERNATEA Linn.

*62. CORALLOCARPUS EPIGAEUS Benth. ex Hook. f.; (S.-Patalagaruda); Punjab, Sind, Gujerat, Rajputana, Deccan, Carnatic.

*63. CORCHORUS CAPSULARIS Linn.; (S.-Kalasaka, H. & B.-Narcha); throughout the hotter parts of India.

*64. CORCHORUS FASCICULARIS Lam.; (B.-Bilnalita, Bo.-Hirankhori); throughout the hotter parts of India.

65. CUMINUM CYMINUM Linn.

*66. CYDONIA OBLONGA Mill. Syn.-*C. vulgaris* Pers.; (H.-Bihi, S.-Amritphala); cultivated in Punjab, Kashmir, Nilgiris.

*67. CYLISTA SCARIOSA Roxb. (Bo.-Ranghevada); Madhya Pradesh, West & South India.

68. CYNODON DACTYLON Pers. (H., B. & Bo.-Dhub); throughout India ascending to 8,000 ft. in the Himalaya.

*69. CYPERUS ROTUNDUS Linn.; (S. & Bo.-Musta, B. & H.-Mutha); throughout India, common in waste grounds, gardens, road sides, in open spots & upto an elevation of 6,000 ft.

*70. CYPERUS SCARIOSUS R. Br.; (S.-Nagar mustaka, H. & B.-Nagar Motha) damp places in Bengal, Uttar Pradesh, eastern & southern parts of India.

71. Daucus carota Linn.

*72. Descurainia sophia Linn. ; (H.-Khubkallana); Kashmir to Kumaon upto 14,000 ft. ; E. Himalaya, Salt Range. Peshawar, Baluchistan.

*73. Desmodium gangeticum DC. ; Outer Himalaya upto 5,000 ft. & throughout India.

74. Diospyros melanoxylon Roxb.

*75. Diospyros peregrina Gurkein ; (S.-Tinduka, H. & B.-Gab, Bo.-Tendu) ; throughout India.

*76. Elaeocarpus serratus Linn. ; (B.-Julpai, M.-Olang-karai) W. Indian Peninsula.

77. Erigeron canadensis Linn.

78. Euphorbia antiquorum Linn.

79. Euphorbia hirta Linn.

80. Euphorbia hypericifolia Linn.

81. Euphorbia thymifolia Linn.

*82. Evolvulus alsinoides Linn.; (S.-Vishnugandhi, H.-Sankha pushpi) Tropical and sub-tropical regions of India.

83. Fagonia cretica Linn.

*84. Feronia limonia (Linn.) Swingle, Syn.—*F. elephantum* Corr. ; (Kapittha, H.-Kavitha) ;indigenous in S. India, cultivated in many parts of India.

*85. Ficus bengalensis Linn. ; (S.-Vata, H.-Bor, B.-Bar) ; sub-Himalayan tract, W. Peninsula, planted elsewhere.

*86. Ficus heterophylla Linn. ; (S.-Trayamana, B.-Bhui-dumur) ; throughout hotter parts of India.

*87. Ficus hispida Linn. ; (S.-Kakadumbura, H.-Konea-dumbar) more or less throughout India.

*88. Ficus racemosa Linn. Syn.—*F. glomerata* Roxb. ; (S.-Udumbara, H.-Gulari) ; throughout India.

*89. Fimbristylis junciformis Kunth.; (Santh.-Bindimuthi); Madhya Pradesh, W. Peninsula.

90. Flemingia tuberosa Dalz. (Bo.-Birmova); Konkan.

91. Foeniculum capillaceum Gilb. ; Syn.—*F. vulgare* Gærtn.

92. Garcinia mangostana Linn.; (H., B. & Bo.-Mangustan); cultivated in Madras State, Nilgiris.

93. Gastrochilus pandurata Ridleys ; Konkan, Andamans.

94. Gossypium herbaceum Linn. ; (H., B. & Bo.-Kapas, S.-Karpas); cultivated in N. W. Frontier region of Pakistan, Baluchistan.

95. Grewia hirusta Vahl.

96. Grewia microcos Linn.

97. HELICTERES ISORA Linn.

98. HEMIDESMUS INDICUS R. Br.

*99. HIBISCUS CANNABINUS Linn. ; (S.-Nali, H.-Patsan, Bo.-Ambari) ; generally cultivated.

100. HOLARRHENA ANTIDYSENTERICA Wall.

101. HOLARRHENA MITIS R. Br. (Sinhalese-kiriwolla) ; endemic in Ceylon.

102. HYDROCOTYLE JAVANICA Thunb.

*103. HYPERICUM JAPONICUM. Thunb. ; Khasia Hills, Assam, E. & W. Peninsula.

*104. INDIGOFERA OBLONGIFOLIA Forsk. ; (S.-Jhilla) ; throughout the Indian plains, Baluchistan.

*105. IXORA NIGRICANS Br. ; (Tam.-Mashagani) ; E. & W. Indian Peninsula.

*106. JATEORHIZA PALMATA (Lam.) Miers; (Bo.-Colombo, Tam.-Kolumbu) cultivated in some parts of India.

107. JATROPHA CURCAS Linn.

108. JUGLANS REGIA Linn.

*109. JUSSIAEA SUFFRUTICOSA Linn. (S.-Bhallava-anga, H.-Banlaunga); throughout India.

*110. JUSTICIA GENDARUSSA Burm. (S.-Nila-nirgundi, H.-Nili-nargandi) ; cultivated throughout India.

*111. LEEA INDICA Merrill ; (H. & B.-Kakurjiwan, Bo.-Karkani) ; throughout India, Andamans.

*112. LENS CULINARIS Medic. Syn.—*L. esculenta* Moench ; (B.-Masuri, H. & S.-Masur) ; cold weather crop throughout India.

113. LITSEA CHINENSIS Lam.

114. LUFFA ACUTANGULA var. *amara* Clarke.

*115. MALVA ROTUNDIFOLIA Linn. ; (H. & Bo.-Khubazi) ; Sind, Baluchistan, Wazirstan, plains of N. India, ascending to 10,000 ft., Kumaon.

*116. MANGIFERA INDICA Linn.; (H., B. & Bo.-Amb, S.-Amva); indigenous in Sikim, Assam, Khasia hills, Khandesh, along the W. Ghats, cultivated in the tropical regions.

*117. MELASTOMA MALABATHRICUM Linn.; Burma-Myetpye, Tel.-Pattudu); throughout India except the Desert.

*118. MENTHA LONGIFOLIA Hunds. Syn.— *M.-sylvestris* Linn. (Bo., H. & S.-Pudina); W. Himalaya, 4,000 to 12,000 ft.

*119. MESUA FERREA Linn. (S., H. & B.-Nagkeshar, Bo.-Nagchampa); Mountains of E. Himalaya & E. Bengal, Assam, ever green rain forests of N. Kanara & S. Konkan, forests of W. Ghats, Andamans.

*120. MIMOSA PUDICA Linn.; (S.-Lajja, H. & Bo.-Lajalu); naturalized more or less throughout India.

*121. MIMUSSOPS ELENGI Linn.; (S., H. & B.-Bakul Bo.-Borasali); Andamans, W. Peninsula, Khandala Ghats, Circars.

*122. MORINDA CITRIFOLIA Linn.; (H. & B.-Ach, Bo-Aal); indigenous in the Darjeeling Terai and Andamans and along the Konkan coast, cultivated largely in India.

*123. MORINDA UMBELLATA Linn.; (Bo.-Al, S.-Pitadaru); Khasia hills, Madras State, E. Ghats., W. Ghats.

124. MUSA SAPIENTUM O. Kuntze.

*125. MUCUNA PRURITA Hook.; (S.-Atmagupta, H.-Kiwach); Punjab plain, from base of Himalayas to Ceylon & Burma.

*126. MURRAYA KOENIGII Spreng.; (S.-Sourabhi-nimba, H.-Katnim); Konkan, W. Ghats, Deccan, S. M. Country, Madras State, along the foot of Himalaya from Kumaon to Sikkim, upto 5,000 ft., Bengal.

*127. MURRAYA PANICULATA Jack; (H.-Marchula, B.-Kamini); outer Himalaya from the Jumna eastwards, ascending to 4,500 ft., Assam Satpura Range, Peninsula.

128. MYRICA NAGI Thunb.; (S.-Katphala, H., B. & Bo.-Kaiphal).

*129. MYRTUS COMMUNIS Linn.; (H.-Vilayiti mehdi, B.-Sutr-sowa); indigenous from the Mediterranean to N. W. Himalaya, gardens, throughout India.

*130. NANNORHOPS RITCHIEANA H. Wendl.; (H.-Mazri); Punjab, Sind, Waziristan, Baluchistan.

*131. NEPETA ELLIPTICA Royle ex. Benth.; (P.-Tukhmalanga); W. temperate Himalaya, from Kashmir to Garhwal, 6,000 to 8,000 ft.

*132. NYMPHAEA ALBA Linn; (Kash.-Brimposh, Bo.-Pandharen-kamal); Kashmir lakes.

*133. NYMPHAEA PUBESCENS Willd., (M.-Alli); all over India in the warmer parts.

*134. OCIMUM AMERICANUM Linn. Syn.-*O. canum* Sims., (H. & B.-Kala tulshi); plains and lower hills of India.

*135. OCIMUM BASILICUM Linn.; (S.-Munjariki); indigenous on the lower hills of the Punjab, cultivated throughout the greater parts of India.

136. OLDEN-LANDIA AURICULARIA K. Schum.

*137. OROXYLUM INDICUM Vent.; (S.-Syonaka, H.-Arlu, B.- Sona); throughout India, except in the Western drier area.

*138. OXALIS CORNICULATA Linn.; (S.-Amlika, H. & B.-Amrul); nearly all regions throughout the warmer parts of India, in the Himalayas upto 8,000 ft.

*139. PAVONIA ODORATA Willd.; (S.-Harivera, B.-Bala, Bo.-Kala vala); N. W. India Bundelkhand, Sind, Baluchistan, Rajasthan, Bengal, Konkan, S. M. Country, Deccan.

140. PEUCEDANUM GRAVEOLENS Benth.

141. PHASEOLUS TRILOBUS Ait.

*142. PHYLLANTHUS EMBLICA Linn.; (S.-Dhatriphala, H.-Aoula, Bo.-Amla); throughout tropical India, wild or planted.

*143. PHYLLANTHUS NIRURI Linn.; (S.-Bhumya-amalaki, H.-Jar-amla); throughout the hotter parts of India from the Punjab to Assam and southwards to Travancore.

144. PHYLLANTHUS URINARIA Linn.

145. PIPER LONGUM Linn.

*146. PIPER NIGRUM Linn.; (S.-Maricha, H.-Golmirch, B.-Golmarich); cultivated in hot damp parts of India.

147. PISTACIA INTEGERRIMA Stew.

148. PISTIA STRATIOTES Linn.

*149. PLANTAGO CILIATA Desf.; Punjab hills, Sind, Baluchistan.

150. PLANTAGO MAJOR Linn.

151. PLANTAGO OVATA Forsk.

*152. PLATANUS ORIENTALIS Linn. (P. & Kash.-Buin); N. W. Himalaya, 5,000 to 8,000 ft., cultivated only.

153. PLUMBAGO ZEYLANICA Linn.

154. PSIDIUM GUAJAVA Linn.

*155. PULICARIA DYSENTERICA Gaertn. Kashmir at 5,000-6,000 ft.

*156. PUNICA GRANATUM Linn.; (S.-Darimba, H.-Anar): wild in Salt range and in the Himalayas from 3 000 to 6,000 ft., also cultivated in many parts of India.

157. RHEUM EMODI Wall.

*158. RUBIA CORDIFOLIA Linn.; (S. & B.-Manjistha, H.-Manith; Bo.-Manjit); throughout India in hilly districts.

*159. RUMEX SCUTATUS Linn.; (English-French sorrel); W. Himalaya.

*160. RUMEX VASICARIUS Linn.; (S.-Chukra, H., B. & Bo.-Chuka); indigenous to W. Punjab, the Salt Range & Trans-Indus Hills, also cultivated.

*161. SALIX ALBA Linn.; (P.-Bis, Kash.-Vuir); cultivated in N. W. Himalaya.

162. SAPINDUS TRIFOLIATUS Linn.

163. SARACA INDICA Linn.

*164. SCINDAPUS OFFICINALIS Schott.; (H. & B.-Gajapipal. Bo.-Thora-pimple); from Sikkim eastwards, Bengal, Chittagong, Andamans.

165. SEMECARPUS ANACARDIUM Linn. f.

*166. SHOREA ROBUSTA Gaertn. f.; (S., H., B. & Bo.-Sal); Punjab, along the Sub-Himalayan tract to Assam, Garo Hills, Orissa, Khasia hills, Jaintia hills, Madhya Pradesh.

*167. SIDA SPINOSA Linn.; (S.-Nagabala, H.-Gulsakari, B.-Bonmethi); throughout the hotter parts of India from N. W. India to Ceylon.

*168. SMILAX PROLIFERA Roxb.; (H.-Ram dataum); Kumaon, Nepal. Sylhet, Bengal, Bihar, Deccan, Peninsula.

*169. SOLANUM NIGRUM Linn.; (S. & B.-Kakmachi, Bo.-Mako); throughout India, upto 9,000 ft. in the W. Himalayas.

*170. SOYMIDA FEBRIFUGA A. Juss.; (S. Rohuna, H., B. & Bo.-Rohan); dry forests of W. Peninsula extending to Merwar & Chota Nagpur.

*171. SPILANTHES ACMELLA Murr.; (Bo. & P.-Akarkara); throughout India, upto 5,000 ft. in the Himalayas & other mountains.

*172. STACHYTARPHETA JAMAICENSIS Vahl. var. *indica* Lam. Syn.—*S. indica* Vahl.; (M.-Simainayuruvi); tropical India from the Punjab & Sylhet to Travancore.

173. STRYCHNOS NUX-VOMICA Linn.

174. SYMPLOCOS RACEMOSA Roxb.

*175. SYZYGIUM CUMINI (Linn.) Skeels. Syn.—*Eugenia jambolana* Lam.; (H. & B.-Jam); throughout India.

*176. SYZYGIUM JAMBOS (Linn.) Alst. Syn.—*Eugenia jambos* Linn.; (H. & Bo.-Gulabjaman); Sikkim Terai.

*177. SYZYGIUM OPERCULATUM Gamble, Syn.—*Eugenia operculata* Roxb.; (H.-Rai-jaman, S.-Bhumbi-jambu); sub-Himalayan tract, common in Savannahs in Sal forests, Bihar, Assam, Sylhet, Chittagong.

*178. TECTONA GRANDIS Linn. f.; (S.-Saka, H. & B.-Segun); Konkan, W. Ghats of Bombay & Madras States, Deccan, Carnatic, Madhya Bharat, Circars.

179. TERMINALIA ARJUNA W. & A.

180. TERMINALIA CHEBULA Retz.

181. TERMINALIA CITRINA Fleming.

*182. TRIUMPHETA BARTRAMIA Linn.; (H.-Chikti, B.-Bun-akora); throughout tropical & sub-tropical India, ascending to 4,000, ft. in the Himalaya.

183. TYLOPHORA ASTHMATICA Wight & Arn.

*184. TYPHA ELEPHANTINA Roxb.; (B.-Hegla, Bo.-Ramban, Kash.-Pitz); marshes from N. W. India to Assam & Southwards, Indus Delta.

*185. URARIA LAGOPOIDES DC.; (Bo.-Dowla, H. Pithvan); Tropical zone, Nepal, Chota Nagpur Bengal to Ava.

186. VATERIA INDICA Linn.

*187. WOODFORDIA FRUTICOSA Kurz.; (S.-Dhataki, H. & B.-Dhai); throughout India, Baluchistan.

*188. WRIGHTIA TINCTORIA R. Br.; (S.-Asita kutanja, H.-Mitha indarjou, Bo.-Indrajau); Rajasthan, Madhya Pradesh, Deccan, Konkan, S. M. Country, Circars, W. Ghats of Madras State.

Indian Plants considered to be Useful in Cholera and Prolonged Fevers such as the Enteric Group

1. ACONITUM FEROX Wall.

*2. ARTABOTRYS SUAVEOLENS Blume; Chittagong, Sylhet.

*3. BLUMEA LACERA DC.; (B.—Kukursunga, Bo.—Nimrudi); throughout plains of India, upto 2,000 ft.

*4. CAPPARIS ZEYLANICA Linn.; (H.-Ardanda, B.-Kalu-kera); Indian gardens.

*5. CAPSICUM FRUTESCENS Linn. Syn.-*C. minimum* Roxb.; cultivated, but not extensively.

*6. CARAPA MOLUCCENSIS Lam.; (B.-Pussar); Littoral forests of Bengal and Andamans.

7. CASSIA ANGUSTIFOLIA Vahl.

*8. DESMODIUM GANGETICUM DC. (S. & Bo.-Shal Parni, H.-Sarivan); outer himalayas and throughout India.

*9. DRYNARIA QUERCIFOLIA J. Sm. (Bo.-Basingh, S.-Ashvakatri); throughout plains of India, on trees or rocks.

*10. ELAEOCARPUS TUBERCULATUS Roxb. (S. Rudraksha, M.-Rutthrakshan); Western Indian Peninsula.

*11. ERYCIBE PANICULATA Roxb.; (Santh.-Kari, Tam.-Unankodi); throughout India.

*12. ERYTHROXYLUM MONOGYNUM Roxb. (M. Devadarum); Madras, N. Circars. dry evergreen forests of Deccan and Carnatic, W. Ghats, dry hill forests of Travancore.

13. EUPHORBIA HELIOSCOPIA Linn.

*14. FAGONIA CRETICA Linn. (H.-Damahan, P.-Dama); Deccan, W. Khandesh, Cutch, Sind, Baluchistan, Wazirstan, W. Rajasthan, Upper gangetic plain, Punjab.

*15. FLACOURTIA INDICA Merr. Syn.-*F. ramontchi* L' Herit.; (B. Bincha); Sub-Himalayan tract, Upper Gangetic Plain, common in Peninsula, W. Ghats, Forests of the N. Circars and Deccan upto 3,000 ft.

*16. GREWIA HIRUSTA Vahl. Symb. (Bo.-Gowali, H. Kukarbicha); Sub-Himalayan tract upto 4,500 ft. from the Indus eastwards, Salt Range, Bihar, Orissa.

*17. GREWIA MICROCOS Linn. (M.-Kottei); E. Bengal, Assam, W. Peninsula, Mysore.

18. KALANCHOE SPATHULATA DC.

*19. LODOICEA MALDIVICA Pers. Syn.-*L. seychellarum* Labill. (H. & Bo.-Darya-kanariyal); cultivated in India.

*20. MARRUBIUM VULGARE Linn.; (H.-Pahari gandana); Kashmir from 5,000 to 8,000 ft Baluchistan etc.

*21. MOMORDICA CHARANTIA Linn. (H.-Karela, B.-Karala, Bo.-Karla); cultivated throughout India

*22. MUSA PARADISIACA Linn. var. *sapientum* Kuntze. Syn.-*M. sapientum* Linn. (S.-Ramoha, H. & Bo.-Kela); commonly cultivated.

*23. OLDENLANDIA AURICULARIA K. Schum.; (B.-Muttia-lata, Bo.-Dapoli); almost all over India.

*24. POINCIANA PULCHERIMA Linn. Syn.-*Caesalpinia pulcherima* Swartz. (B.-Krishnachura, S. & Tam.-Ratna-gandhi); Gardens throughout India.

*25. PSIDIUM GUAJAVA Linn. (H.-Amrud, Bo.-Perala); cultivated & naturalized throughout India.

26. SAPINDUS TRIFOLIATUS Linn.

27. SCHLEICHERA OLEOSA (Lour.) Merr. Syn.-*S. trijuga* Willd.

*28. SCHWEINFURTHIA SPHEROCARPA Br.; (S. H. & Bo.-Sanipat); Rajasthan Desert, Sind, Baluchistan.

*29. SOLANUM MELONGENA Linn.; (S.-Bartaku, H.-Baigun); widely cultivated in India.

* 30. SOPHORA TOMENTOSA Linn.; (Burm.-Thimbawmagyi); Andaman & Nicobar Islands; very occasionally in Indian gardens.

31. STYRCHNOS NUX-VOMICA Linn.

32. TERMINALIA CHEBULA Retz.

*33. TERMINALIA CITRINA Fleming.; (H.-Harira, B.-Haritaki); Assam, Dacca, Mymensingh.

*34. TERMINALIA PANICULATA Roth.; (Bo -Kindal, M.-Pekarakai; Western regions of the Peninsula from Bombay through Kanara & Malabar to Travancore, upto 2,000 ft., Coorg, Nilgiris, Anamalais Cuddapah, Ballary.

35. TRACHYSPERMUM AMMI (Linn.) Sprague, Syn.-*Carum copticum* Benth.

*36. ZANTHOXYLUM BUDRUNGA Wall.; (Bazinali, Bo.-Tessul, H.-Badrang); Konkan, Deccan, S. M. Country, N. Kanara, W. Ghats in S. Kanara, Mysore, Malabar, Annamalais and Travancore at low elevations, Orissa, Sylhet, Khasia Hills, Chittagong.

Indian Plants considered to have Emmenagogue and Abortifacient Properties

1. ABRUS PRECATORIUS Linn.
2. ALOE BARBADENSIS Mill.
3. ANANAS COMOSUS Linn.
4. ANNONA SQUAMOSA Linn.
5. APIUM GRAVEOLENS Linn.
6. ARECA CATECHU Linn.
7. ARISTOLOCHIA BRACTEATA Retz.
8. ARISTOLOCHIA INDICA Linn.
9. ARTEMISIA VULGARIS Linn.
10. CALOTROPIS GIGANTEA (Linn.) Dryand (*C. gigantea* R. Br.)
11. CALOTROPIS PROCERA (Linn.) Dryand (*C. procera* R. Br.)
12. CARICA PAPAYA Linn.
13. CELASTRUS PANICULATUS Willd.
14. CINCHONA CALISAYA Wedd.
15. CINNAMOMUM CAMPHORA Nees. & Eberm.
16. CITRULLUS COLOCYNTHIS Schrid.
17. CROCUS SATIVUS Linn.
18. CUCUMIS TRIGONUS Roxb.
19. CUSCUTA REFLEXA Roxb.
20. DAUCUS CAROTA Linn.
21. DOLICHANDRONE FALCATA Seem.
22. EUPHORBIA TIRUCALLI Linn.
23. EXCOECARIA AGALLOCHA Linn.
24. GARCINIA MORELLA Desr.
25. GLORIOSA SUPERBA Linn.
26. GOSSYPIUM HERBACEUM Linn.

*27. LEPIDIUM SATIVUM Linn.; (S.-Chandrasuru, H.-Chansaur, B.-Halim); cultivated throughout India.

28. MOMORDICA CHARANTIA Linn.

*29. MOMORDICA TUBEROSA Cogn. (*M. cymbalaria* Fenzl ex. Naud); Bo.-Kadavanchi); Western parts of India.

30. MORINGA OLEIFERA Lam. (*M. pterygosperma* Geratn.)
31. NERIUM INDICUM Mill. (*N. odorum* Soland.)

32. Nigella sativa Linn.

33. Peganum harmala Linn.

34. Plumbago indica Linn. (*P. rosea* Linn.)

35. Plumbago zeylanica Linn.

*36. Plumeria rubra Linn. var. *acutifolia* Bailey (*P. acutifolia* Poir, *P. acuminata* Ait.); (S.-Kahira champa, H. & Bo.-Khair champa); cultivated throughout India, naturalized in many parts.

37. Randia dumetorum Lam.

38. Rubus moluccanus Linn.

39. Ruta graveolens Linn.

40. Salicornia brachiata Roxb.

41. Sapindus trifoliatus Linn.

42. Semecarpus anacardium Linn. f.

43. Sesamum orientale Linn. (*S. indicum* Linn.)

44. Stachytarpheta jamaicensis (Linn.), Vahl. var. *indica* H. J. Lam. (*S. indica* Vahl).

45. Taxus baccata Linn.

46. Thevetia peruviana (Pers) Merr. (*T. neriifolia* Juss. ex. Steud).

47. Trianthema pentandra Linn.

48. Trianthema portulacastrum Linn. (*T. monogyna* Linn.)

*49. Urena lobata Linn. (H.-Bachata, B.-Bonokra); hotter parts of India, a weed of waste places, forest clearing and roadsides; common in bambo and mango clumps of Bengal.

50. Withania somnifera Dun.

Indian Plants liable to produce Dermatitis

1. Abroma augusta Linn.

2. Ailanthus altissima (Mill.) Swingle (Syn. *A. glandulosa* Desf.)

3. Anacardium occidentale Linn.

4. Anagallis arvensis Linn.

5. Anthemis cotula Linn.

6. Apium graveolens Linn.

7. Arisaema speciosum (Wall.) Mart.

*8. Arisaema tortuosum (Wall.) Schott.; (P.-Don, Nep.-Birbanka); from Simla to Sikkim & Bhutan at 8,000 ft., Khasia hills, Manipur, Ranchi, W. Ghats.

*9. Asparagus officinalis Linn.; (P., H. & Kash.-Allipalli); from Kashmir to Bhutan, Khasia Hills, Assam.

10. CALOTROPIS GIGANTEA (Linn.) Dryand.

11. CALOTROPIS PROCERA (Linn.) Dryand.

12. CANNABIS SATIVA Linn.

*13. CISSUS SETOSA Roxb.; (H.-Karmal, Bo.-Khaj-goli-cha-vel); Deccan, W. Ghats of Madras State.

14. DATURA STRAMONIUM Linn.

15. DAUCUS CAROTA Linn.

*16. DELPHINIUM AJACIS Linn.; commonly cultivated in gardens.

*17. DICTAMNUS ALBUS Linn.; from Kashmir to Kunawar.

18. ERIGERON CANADENSIS Linn.

19. EUPHORBIA ACAULIS Roxb.

20. EUPHORBIA ANTIQUORUM Linn.

21. EUPHORBIA CATTIMANDO W. Elliot (*E. trigona* Fl. Brit. Ind., in part).

22. EUPHORBIA HELIOSCOPIA Linn.

23. EUPHORBIA NERIIFOLIA Linn.

24. EUPHORBIA NIVULEA Buch. Ham.

25. EUPHORBIA PEPLUS Linn.

26.* EUPHORBIA ROTHIANA Spreng.

27. EUPHORBIA ROYLEANA Boiss.

*28. EUPHORBIA THOMSONIANA Boiss.; (Kash.-Hirtiz); Kashmir 10,000 to 12,000 ft.

29. EUPHORBIA TIRUCALLI Linn.

30. EUPHORBIA TRIGONA Haw.

31. EXCOECARIA AGALLOCHA Linn.

32. FAGOPYRUM ESCULENTUM Moench.

33. FLEURYA INTERRUPTA Gaudich.

*34. GINKGO BILOBA Linn.; (English-Maiden-hair-tree); rarely cultivated in gardens.

*35. GIRARDINIA HETEROPHYLLA Decne.; Mount Abu, Chota Nagpur, W. Peninsula.

36. HEDERA HELIX Linn.

*37. HIPPOMANE MANCINELLA Linn.; (English-Manchineal tree); introduced into Indian gardens.

38. HOLIGARNA ARNOTTIANA Hook. f.

39. HOLIGARNA GRAHAMII (Wight) Hook. f.

40. Holigarna longifolia Buch. Ham. ex. Roxb.

41. Humulus lupulus Linn.

42. Hypericum perforatum Linn.

43. Laportea crenulata Gaudich.

*44. Laportea terminalis Wight.; sub-tropical Himalayas from Kumaon to Mishmi at 4,000 to 8,000 ft., Madhya Pradesh, W. Ghats of Madras State.

*45. Lasiosiphon eriocephalus Decne ; (Bo.-Rametha) W. Ghats of Bombay and Madras States also Nilgiris.

*46. Leonurus cardiaca Linn.; Kumaon, Kashmir, Hazara, Kurrum valley.

*47. Lobelia excelsa Lesch.; W. Ghats of S. India, Nilgiris, Pulney, Travancore above 6,000 ft.

*48. Lobelia nicotianifolia Heyne. (B. & H.-Nala, Bo.-Dhavala); W. Ghats from Bombay to Travancore at 3,000 to 7,000 ft., Konkan, Deccan, Nilgiris, Malabar.

*49. Mucuna atropurpurea DC.; plains of Western India.

*50. Mucuna gigantea DC.; (Malay.-Kaku-vali); a littoral species found on the Indian Coast.

*51. Mucuna hirsuta Wight & Arn.; plains of Western India.

*52. Mucuna monosperma DC.; (Bo., Sonogaravi, M.-Thelu-Kodi); E. Himalaya, Khasia Hills, Assam, Chittagong, Konkan, S. M. Country.

53. Mucuna prurita Hook. (*M. pruriens* Fl. Brit. Ind., non DC.)

54. Nerium oleander Linn.

55. Podophyllum hexandrum Royle. (Syn.—*P. emodi* Wall. ex. Hook. f. & Thoms.)

56. Polygonum hydropiper Linn.

57. Ranunculus sceleratus Linn.

58. Rhus insignis Hook. f.

59. Rhus punjabensis J. L. Stew. ex. Brand.

60. Rhus succedanea Linn.

61. Rhus wallichii Hook. f.

62. Rumex acetosa Linn.

63. Rumex acetosella Linn.

*64. Ruta graveolens Linn,; var. *angustifolia* Hook. f.; (S.-Somalata, H.-Gadab, B.-Ermul, Bo.-Satap), cultivated in Indian gardens.

65. Sapium insigne Trimen.

66. Schima wallichii Choisy.
67. Semecarpus anacardium Linn. f.
68. Semecarpus travancoricus Bedd.
69. Tragia bicolor Miq.
70. Tragia involucrata Linn.
71. Urtica dioica Linn.
72. Urtica hyperborea Jacq.
73. Urtica parviflora Roxb.
74. Urtica pilulifera Linn.
75. Wallichia disticha T. Anders.
76. Xanthium strumarium Linn.

Indian Plants considered to have Insecticidal & Piscicidal Properties.

1. Acacia pennata (Linn.) Willd.
2. Acorus calamus Linn.
*3. Acorus gramineus Soland; Sikkim Himalaya upto 6,000 ft., Khasia hills 4,000-5,000 ft.
4. Acronychia pedunculata (Linn.) Miq. (Syn.—*A. laurifolia* Blume).
5. Adina cordifolia (Roxb.) Benth. & Hook. f.
6. Agava americana Linn.
*7. Albizzia chinensis (Osbeck) Merr. (Syn.-*A. stipulata* Boiv.); (B.-Amluki, Bo.-Udala); throughout India, ascending to 4,000 ft. in the Himalaya.
8. Albizzia procera (Roxb.) Benth.
9. Anacardium occidentale Linn.
10. Anagallis arvensis Linn.
11. Anamirta cocculus (Linn.) Wight & Arn.
12. Andrachne cordifolia Muell. Arg.
13. Annona reticulata Linn.
14. Annona squamosa Linn.
*15. Apama tomentosa Engl. (Syn.-*Bragantia tomentosa* Blume); Assam & Manipur.
16. Arenga obtusifolia Mart.
17. Arisaema speciosum (Wall.) Mart.
18. Arisaema tortuosum (Wall.) Schott.

19. ARISTOLOCHIA BRACTEATA Retz.

20. ARTEMISA ABSINTHIUM Linn.

21. ARTEMISIA VULGARIS Linn.

22. ASCLEPIAS CURASSAVICA Linn.

23. AZADIRACHTA INDICA A. Juss. (Syn.-*Melia azadirachta* Linn.)

24. BALANITES AEGYPTIACA Delile (Syn.-*B. roxburghii* Planch.)

25. BAMBUSA BAMBOS Druce (Syn.-*B. arundinacea* Willd.)

26. BARRINGTONIA ACUTANGULA (Linn.) Gaertn.

27. BARRINGTONIA ASIATICA (Linn.) Kurz. Syn.-*B. speciosa* Forst.)

*28. BARRINGTONIA RACEMOSA (Linn.) Roxb ; (S.-Nipa, H.-Ijjul); Western sea coast of India, from Konkan to Travancore, Assam, Sunderbans.

29. BERBERIS ARISTATA DC. (possibly some other species of Berberis also).

30. BUTEA MONOSPERMA (Lam.) Kuntze (Syn.-*B. frondosa* Koen ex. Roxb.)

31. CAESALPINIA NUGA (Linn.) Ait.

32. CALLICARPA LONGIFOLIA Lam. var. *lanccolaria* C. B. Clarke.

33. CALONYCTION MURICATUM (Linn.) G. Don. (Syn.-*Ipomoea muricata* Jacq.)

34. CALOPHYLLUM INOPHYLLUM Linn.

35 CANNABIS SATIVA Linn.

*36. CARDARIA DRABA Desv. (Syn.-*Lepidium draba* Linn.); (Afgh.-Bijindak) a weed of cultivation in the Punjab & N. W. Frontier Pakistan.

37. CAREYA ARBOREA Roxb.

38. CASEARIA GRAVEOLENS Dalz.

*39. CASEARIA TOMENTOSA Roxb.; (H. & Bo.-Chillara); throughout India, ascending to 3,000 ft. in Himalayas.

40. CASSYTHA FILIFORMIS Linn.

41. CENTRATHERUM ANTHELMINTICUM (Willd.) Kuntze (Syn.-*Vernonia anthelmintica* Willd.)

42. CERBERA MANGHAS Linn. (Syn.-*C. odollam* Gaertn.)

43. CHRYSANTHEMUM CINERARIAEFOLIUM Vis.

44. CHRYSANTHEMUM COCCINEUM Willd.

45. CIMICIFUGA FOETIDA Linn.

46. CINCHONA CALISAYA Wedd.

47. CINCHONA OFFICINALIS Linn.

48. CINCHONA SUCCIRUBRA Pav. ex Klotzsch.

49. CINNAMOMUM CAMPHORA Nees & Eberm.

50. CLEISTANTHUS COLLINUS Benth. & Hook. f.

51. CORYPHA UMBRACULIFERA Linn.

52. CROTON OBLONGIFOLIUS Roxb.

53. CROTON TIGLIUM Linn.

54. CUCUMIS SATIVUS Linn.

55. CURCUMA LONGA Roxb.

*56. CYMBOPOGON NARDUS (Linn.) Rendle (Syn.-*Androp. on nardus* Linn.) (Bo.-Kamkher, H.-Ganjni); throughout the hotter parts, wild or cultivated.

57. CYNANCHUM ARNOTTIANUM Wight.

58. DALBERGIA STIPULACEA Roxb.

59. DELPHINIUM BRUNONIANUM Royle.

60. DELPHINIUM CAERULEUM Jacquem ex Cambess.

61. DELPHINIUM ELATUM Linn.

62. DERRIS ELLIPTICA (Roxb.) Benth.

63. DERRIS FERRUGINEA (Roxb.) Benth.

64. DERRIS SCANDENS (Roxb.) Benth.

*65. DERRIS TRIFOLIATA Lour., var. *uliginosa* (Roxb ex. Willd.) (Syn.-*D. uliginosa* Benth., *Robinia uliginosa* Roxb. ex. Willd.)

66. DIOSCOREA HISPIDA Dennst (Syn.-*D. daemona* Roxb.)

67. DIOSCOREA PRAZERI Prain, Burkill (Syn.-*D. deltoidea* Wall., var. sikkimensis Prain).

68. DIOSPYROS EBENUM Koen.

*69. DIOSPYROS MONTANA Roxb.; (S.-Tumala, H.-Lohori, B.-Bangab); throughout India, from Kanara eastwards in the sub-Himalayan tract.

*70. DIOSPYROS PANICULATA Dalz.; (S.-Thinduka, M.-Karinthuvari), S. M. Country, Travancore, Kanara, Malabar.

71. DODONAEA VISCOSA (Linn.) Jacq.

72. DOLICHANDRONE FALCATA Seem.

73. DURANTA REPENS Linn. (Syn.-*D. plumieri* Jacq.)

74. EDGEWORTHIA GARDNERI Meissn.

75. ENTADA PURSAETHA DC. (Syn.-*E. scandens* Benth).

*76. EREMOSTACHYS SUPERBA Royle ex. Benth.; W. Himalaya, Punjab, Garhwal.

77. Eremostachys vicaryi Benth.

78. Eucalyptus globulus Labill.

79. Eupatorium odoratum Linn.

80. Euphorbia antiquorum Linn.

81. Euphorbia neriifolia Linn.

82. Euphorbia royleana Boiss.

83. Euphorbia thymifolia Linn.

84. Euphorbia tirucalli Linn.

85. Excoecaria agallocha Linn.

86. Fluggea leucophyrus (Koen.) Willd.

87. Fluggea virosa (Roxb. ex. Willd.) Baill. (Syn.-*F. microcarpa* Blume.)

*88. Gardenia campanulata Roxb.; (Burm.-Hsathanpaya); foot of Sikkim Himalaya, Assam, Sylhet, Chittagong, Bihar.

89. Gaultheria fragrantissima Wall.

90. Gloriosa superba Linn.

91. Gnetum scandens Roxb.

92. Gynandropsis gynandra (Linn.) Merr. (Syn.-*G. pentaphylla* DC.)

93. Gynocardia odorata R. Br.

94. Harpullia cupanioides Roxb.

95. Hedera helix Linn.

96. Hydnocarpus kurzii (King) Warb. (Syn.-*Taraktongenos kurzii* King).

97. Hydnocarpus laurifolia (Dennst.) Sleumer (Syn.-*H. wightiana* Blume).

98. Hydrocotyle javanica Thunb.

99. Jatropha curcas Linn.

100. Juglans regia Linn.

101. Kalanchoe spathulata (Poir.) DC.

*102. Lagenandra toxicaria Dalz. (Many authors view this species as synonymous with *L. ovata* (Linn.) Thw. of Ceylon); (Bo.-Rakhalu, M.-Maravara, Tsjmul); Konkan to N. Kanara, Travancore, Mysore, Coorg, Cochin.

103. Lasiosiphon eriocephalus Dcne.

*104. Linostoma decandrum Wall.; Sylhet, Chittagong.

105. Madhuca latifolia (Roxb.) Macbride (Syn.-*Bassia latifolia* Roxb.).

106. MADHUCA LONGIFOLIA (Linn.) Macbride (Syn.—*Bassia longifolia* Linn.

107. MAESA INDICA Wall.

108. MELALEUCA LEUCADENDRON Linn.

109. MELODINUM MONOGYNUS Roxb.

110. MILLETTIA AURICULATA Baker ex. Brand.

*111. MILLETTIA PACHYCARPA Benth.; forests of Garo & Khasia Hills, Sikkim & Assam upto 4,000 ft.

*112. MILLETTIA PISCIDIA Wight & Arn.; Sikkim and Assam.

113. MUNDULEA SERICEA (Willd.) Greenway (Syn.—*M. suberosa* Benth.)

114. MYRICA NAGI Thunb.

115. NICANDRA PHYSALOIDES Gaertn.

116. NICOTIANA RUSTICA Linn.

117. NICOTIANA TABACUM Linn.

118. NIGELLA SATIVA Linn.

*119. OCIMUM GRATISSIMUM Linn.; (S.-Vantulshi, H. & B.-Ramtulshi); common wild plant in W. India cultivated in gardens in Bengal, Nepal, Deccan Peninsula.

120. OUGEINIA DALBERGIOIDES Benth.

121. PACHYGONE OVATA (Poir) Miers ex. Hook. f. & Thoms.

122. PEGANUM HARMALA Linn.

123. PHYLLANTHUS URINARIA Linn.

124. PICRASMA JAVANICA Blume, var. *nepalensis* Badhwar nov. comb. (Syn.-*P. nepalensis* Benn.).

125. PIERIS OVALIFOLIA D. Don.

126. PITHECELLOBIUM BIGEMINUM Mart. (Syn.—*Pithecolobium bigeminum* Benth).

127. POGOSTEMON HEYNEANUS Benth. (Syn.-*P. patchouli* Hook. f. in Fl. Brit.-Ind., non. Pellet.)

128. POLYGONUM FLACCIDUM Meissn.

129. POLYGONUM HYDROPIPER Linn.

130. PONGAMIA PINNATA Linn. Merr. (Syn.-*P. glabra* Vent.)

131. PYGEUM GARDNERI Hook. f.; (Bo.-Daka); W. Ghats of Bombay & Madras States, hills of Travancore, Malabar, Nilgiris, Pulneys the Deccan.

132. RANDIA DUMETORUM Lam, (Split up into three species by Gamble).

133. RANDIA ULIGINOSA DC.

134. RAUWOLFIA SERPENTINA Benth. ex Kurz.

135. RHODODENDRON BARBATUM Wall. ex. G. Don., (Nepl.-Guras); Kumaon to Bhutan at 8,000 to 12,000 ft., Sikkim.

136. RHODODENDRON FALCONERI Hook. f.; (Nepl.-Kurling); East Nepal to Bhutan at 9,000-13,0000 ft.

137. RICINUS COMMUNIS Linn.

138. RUTA GRAVEOLENS Linn. var. *angustifolia* Hook. f.

139. SANTALUM ALBUM Linn.

140. SAPINDUS MUKOROSSI Gaertn.; (S.-Phenila, H., B. & Bo.-Ritha), cultivated throughout N. W. India, Bengal & Assam, wild on the Himalayas upto 4,000 ft.

141. SAPINDUS TRIFOLIATUS Linn.

142. SAPIUM INDICUM Willd.

143. SARCOSTEMMA ACIDUM (Roxb.) Voigt (Syn.-*S. brevistigma* Wight & Arn.)

144. SAUSSUREA LAPPA C. B. Clarke.

145. SCHLEICHERA OLEOSA (Lour.) Merr. (Syn.-*S. trijuga* Willd.)

*146. SCLERIA PERGRACILIS (Nees) Kunth widely scattered from Garhwal at 5,000 ft. to Assam, Bihar, Chota Nagpur & Deccan.

147. SOPHORA MOLLIS R. Grah.; (P.-Buna, Arab.-Arghavan); plains and low hills of the North-West, Hazara & the Salt Range to Kumaon & Nepal, upto 7,000 ft., & Bushahr & near Dehra Dun.

148. SPHAERANTHUS INDICUS Linn.

149. STEPHANIA HERNANDIIFOLIA (Willd.) Walp.; (S.-Vanatik-tika, B.-Agnad); W. & E. Coast, Dehra Dun, Biharam (Sikkim, Bengal, Assam, Cachar).

150. STRYCHNOS COLUBRINA Linn.

151. STRYCHNOS NUX-VOMICA Linn.

152. TAXUS BACCATA Linn.

153. TEPHROSIA CANDIDA (Roxb.) DC.

154. TEPHROSIA PURPUREA (Linn.) Pers.

*155. TEPHROSIA VOGELII Hook f.; cultivated by tea planters in Assam.

156. TERMINALIA BELLERICA (Gaertn.) Roxb.

157. THEVETIA PERUVIANA (Pers.) Merr. (Syn.-*T. nereifolia* Juss. ex. Steud.)

*158. TRIGONELLA FOENUM-GRAECUM Linn.; (H. B. & Bo.-Methi); Punjab & Kashmir, cultivated in many parts of India.

159. VERBASCUM THAPSUS Linn.

*160. VITEX NEGUNDO Linn.; (S. & H.-Nirgundhi, B.-Nishinda); throughout India in the warmer zone.

161. WALSURA PISCIDIA Roxb.

162. WIKSTROEMIA INDICA (Linn.) C. A. Mey. var. *viridiflora* (Meissn.) Hook. f.

163. ZANTHOXYLUM ALATUM Roxb.

*164. ZANTHOXYLUM HAMILEONIANUM Wall.; (Nep.-Purpuray timur); throughout Assam, in low level forests, except in the Khasia and Jaintia hills.

CHAPTER X.

Bibliography

In the first edition of The Review, a list of the papers published on the subject under the Indian Council of Medical Research (formerly Indian Research Fund Association) was given. As the scope of the present review has been widened to include all the work done on Indian Indigenous Drugs anywhere, the question of including a comprehensive and if possible a complete bibliography for the new edition was discussed and agreed to by the Secretary Indian Council of Medical Research. In view of the fact that no such bibliography has so far been published and also because this subject has been assuming increased importance both in India and abroad, it was decided that a comprehensive bibliography should form a particular feature of the present edition, inspite of the fact that size of volume would be considerably increased.

During the last 3 or 4 decades the subject of Indian Indigenous Drugs has received considerable attention of many of the scientific workers in this country and their papers have been published in various journals in India and elsewhere. The subject has interested many foreign workers also who have made very important contributions in foreign scientific journals. An attempt has been made to get all the references together, particularly of the work done on the plants of Indian origin. This is a special feature of the bibliography which is given in this Chapter.

To facilitate consultation by workers references have been arranged plant-wise (which are given in alphabetical order,) and in sequence of years in which the papers have been published. In order to attract the immediate attention of the workers the un-orthodox method of giving the title of the paper first and names of authors afterwards has been adopted.

Abbreviations of the journals used are also given in a separate list.

The inclusion of all the available bibliography in the present volume has involved considerable labour and careful sifting. It is hoped that it will be useful to those who wish to consult the previous work done when taking up a plant for investigation. It is by no means such an exhaustive bibliography as we would have wished but it is hoped that it may serve as a first compilation of its kind which can be gradually added to.

List of Journals and Books with the Abbreviations.

Agri. Jr. Ind.	...	Agricultural Journal of India.
Agri. Ledger	...	Agricultural Ledger (Govt. of India).
Amer. Chem. Jr.	...	American Chemical Journal.
Amer. Jr. Pharm.	...	American Journal of Pharmacy.
Analyst.	...	Analyst.
Ann. Bot.	...	Annals of Botany.

Ann. Chem.	...	Annalen der Chemie.
Ann. Chim.	...	Annales de Chemie.
Ann. Chim. Phys.	...	Annales de Chimie et de Physique.
Ann. Chim. Appl.	...	Annales de Chimie analytique appliquee.
Ann. Inst. Past.	...	Annales de l' Institut Pasteur.
Arch. de Pharm.	...	Archiv de Pharmacie.
Arch. Exper. Path. Pharm.		Archiv fur experimentelle Pathologie and Pharmakologie.
Arch. Hyg.	...	Archiv fur Hygiene.
Arch. Pharm.	...	Archiv der Pharmazie.
Biochem. d. Pflzen	...	Biochemie der Pflanzen.
Biochem. Jr.	...	Biochemical Journal.
Biochem. Ztsche.	...	Biochemische Zeitschrift.
B. M. J.	...	British Medical Journal.
Buchn. Repert. Pharm.	...	Repertorium der Pharmacie (Buchner).
Bull. Acad. Sci. Allahabad.		Bulletin of the Academy of Science of Uttar Pradesh of Agra & Oudh, Allahabad.
Bull. Bot. Gard. Kew.	...	Bulletin Botanical Garden Kew.
Bull. Sc. Pharm.	...	Bulletin des Sciences Pharmacologiques.
Bull. Soc. Chim.	...	Bulletin de la Societe Chimique de France.
Bull. Soc. Chim Biol.	...	Bulletin de la Societe de Chimie Biologique.
Bull. Tokyo Inst. Technical.		Bulletin, Tokyo Institute of Technology.
C. C.	...	Chemisches Centralblatt.
Chem. Abst.	...	Chemical Abstract. (American).
Chem. Weekbl.	...	Chemisches Weekblad.
Chem. Ztg.	...	Chemiker-Zeitung.
Chin. Jr. Physiol.	...	Chinese Journal of Physiology.
Compt. Rend.	...	Comptes rendus hebd. des. Seances de l' Academie des Sciences.
Comp. Soc. Biol.	...	Comptes rendus hebd. des Seances de la Societe de Biologie.
Curr. Sci.	...	Current Science.
Helv. Chim. Act.	...	Helvetica Chimica Acta.
Ind. Farming	...	Indian Farming.
Ind. For. Rec.	...	Indian Forest Records (and Bulletin) Dehra Dun.
Ind. For.	...	Indian Forester.
Ind. Jr. Agric. Sci.	...	Indian Journal of Agricultural Science.

Ind. Jr. Ent. ...	Indian Journal of Entomology.
Ind. Jr. Med. & Phys. Sc.	Indian Journal of Medical and Physical Science.
I. J. M. R. ...	Indian Journal of Medical Research.
Ind. Jr. Pharm. ...	Indian Journal of Pharmacy.
Ind. Jr. Vetr. Sci. Animal Husbandry. ...	Indian Journal of Veterinary Science & Animal Husbandry.
I. M. G. ...	Indian Medical Gazette.
I. M. J. ...	Indian Medical Journal.
J. C. S. ...	Journal of the Chemical Society, London.
Jr. Agri. Res. ...	Journal of Agricultural Research.
Jahrb. Prakt. Pharm. ...	Jahrbuch fur Praktische Pharmazie.
Jr. Amer. Pharm. Assoc. ...	Journal of the American Pharmaceutical Association.
Jr. Amer. Chem. Soc. ...	Journal of the American Chemical Society.
Jr. Anamalai Univ. ...	Journal of Anamalai University.
Jr. Assoc. Agri. Chem. ...	Journal of the Association of Official Agricultural Chemists.
Jr. Biol. Chem. ...	Journal of Biological Chemistry.
Jr. Bombay Nat. Hist. Soc.	Journal of Bombay Natural History Society.
Jr. Pharm. ...	Journal der Pharmacie fur Aerzte.
Jr. Ind. Chem. Soc. ...	Journal of the Indian Chemical Society.
Jr. Ind. Inst. Sci. ...	Journal of the Indian Institute of Science, Bangalore.
Jr. Malaria Inst. India. ...	Journal of the Malaria Institute of India.
Jr. Mysore Univ. ...	Journal of the Mysore University.
Jr. Pharm. Chim. ...	Journal de Pharmacie et de Chimie.
Jr. Pharm. Soc. Japan. ...	Journal of the Pharmaceutical Society of Japan.
Jr. Pharm. Exp. Therap. ...	Journal of Pharmacology and Experimental Therapeutics.
Jr. Physiol. ...	Journal of Physiology.
Jr. Pract. Chem. ...	Journal fur Praktisch Chemie.
Jr. Russ. Phys. Chem. Ges.	Journal der Russischen Physikalisch-chemischen Gesellschaft.
Jr. Sci. Indul. Res. ...	Journal of Scientific & Industrial Research.
Jr. Soc. Chem. Ind. ...	Journal of the Society of Chemical Industry.

Jr. Univ. Bombay.	...	Journal of the University of Bombay.
Kew. Bull.	...	Kew Bulletin.
Lancet.	...	Lancet.
Nat. Acad. Sci. Ind.	...	National Academy of Science, India.
Nature.	...	Nature, London.
Pharm. Jr.	...	Pharmaceutical Journal and Pharmacist.
Pharm. Jr. Trans.	...	Pharmaceutical Journal and Transactions.
Pharm. Post.	...	Pharmaceutische Post.
Pharm. Rev.	...	Pharmaceutical Review.
Pharm. Weekbl.	...	Pharmazeutische Weekblad.
Pharm. Ztg.	...	Pharmazeutische Zeitung.
Pharm. Ztschrft. f. Russl.	...	Pharmazetische zitschrift fur Russland.
Philip Aggric.	...	Philippine Agriculturist, Las Banos.
Phil. Jr. Sci.	...	Philippine Journal of Science.
Physiol. Abst.	...	Physiological Abstracts.
Pharmacogn.	...	Pharmacognosie.
Proc. Acad. Sci. U. P.	...	Proceedings of the Academy of Sciences of Uttar Pradesh of Agra & Oudh, Allahabad.
Proc. Chem. Soc.	...	Proceedings of the Chemical Society, London.
Proc. Ind. Acad. Sci.	...	Proceedings of the Indian Academy of Sciences, Bangalore.
Proc. Roy. Soc. Lond.	...	Proceedings of the Royal Society, London.
Quart. Jr. Pharm.	...	Quarterly Journal of Pharmacy and Allied Sciences (Pharmacology), London.
Sci. Cult.	...	Science and Culture.
Z. Physiol. Chem.	...	Zeitschrift fur Physiologische Chemie.

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